HELLENIC REPUBLIC
MINISTRY OF INFRASTRUCTURE
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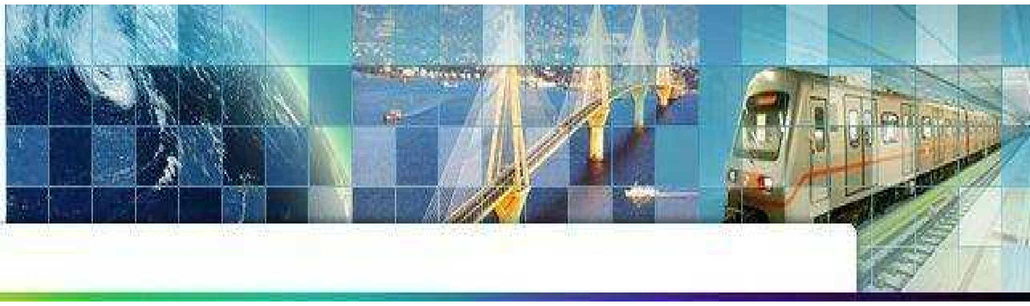

ITS PROGRESS REPORT FOR GREECE

September 2014

Ministry of Infrastructure, Transport & Networks

Progress Report on ITS

According to the 2010/40/EU Directive

Hellenic Ministry of Infrastructure, Transport & Networks

September 2014

This is a joint document authored by the staff of the Hellenic Ministry of Infrastructure, Transport and Networks, according to the requirements of the Directive 2010/40/EU, with the cooperation of the main Hellenic authorities and entities that implement, fund, monitor or simply use ITS. The data presented in this report have been collected from the authorities and entities and have been assessed, elaborated, classified and reviewed by the Ministry

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Executive Summary

In Greece, during the past years and despite the economic challenge, there has been a considerable progress in the field of transport resulting in the modernization of the country's transport systems, predominantly through the investment in "hard" infrastructure but also - and to a large extend- through the proliferation of ITS applications. This review focuses on the implementation of Intelligent Transport Systems and Operations, on which little attention has been paid in the past. With the upgrading of the TMCs in the main road networks and in the two largest cities, Athens and Thessaloniki, the use of VMS along the highways, "intelligent" traffic lights and traffic control cameras, electronic toll collection, information available to the road and public transport users, travel planning and parking applications, the list of ITS applications is quite extensive.

It needs to be highlighted that, several years later, ITS applications are dispersed and fragmented, rendering their overall benefits only partly effective. It becomes obvious that a coordinated planning and design is needed, in order to integrate all these achievements and leverage the benefits of ITS. Effectively, as results from the lack of a National ITS Strategy and Architecture, systems and services are currently deployed in the absence of a clearly defined context, which will provide for the interoperability of ITS applications, as well as for the definition of thematic priorities, for a well-coordinated national approach.

As it was concluded in the "5-year plan" report to the EU (ITS Action Plan 2012 http://www.yme.gr/getfile.php?id=4964), there is a need to invest in a set of strategically required actions for the country's overall transport development over the coming decade, and this investment must be increasingly oriented towards sustainable transport. Realizing the need for a results-based approach, it was also concluded that further steps need to be taken, in order to operationalize the strategic objectives. It was stressed that the National ITS Strategy and Architecture must focus primarily on:

- Developing a common framework for the prioritization of projects and
- Initiating work to monitor the sustainability of our transport operations.

This Progress Report was conducted for the purposes of the ITS Directive and it aims to assess the performance and deployment status of ITS in Greece. This is the first Progress Report on ITS, providing a quick snapshot of the relevant activities during the period 2010-2013. Although this is not the first time that the national authorities are reporting collectively on the activities in the ITS sector, a different approach was taken, for which the structures are yet under development. As such, the assessment of the ITS operations contained in this report is very much a work in progress, and should be considered as such.

The above notwithstanding, it is in general considered that the activities are on track to meeting the strategic objectives and national priorities. In terms of volume, progress has been achieved in ITS investments, nevertheless, the focus lies on leveraging the efficiency through research, capacity building, knowledge sharing and policy dialogue, as well as by establishing the National ITS Strategy and the National ITS Architecture.

While preliminary in nature, the development of a common monitoring and reporting framework for ITS projects has been initiated, and this was done with the contribution of various related authorities and entities their expert staff, with the coordination of the Hellenic Ministry of Infrastructure, Transport & Networks. This endeavour shows that the framework is readily applicable to the projects supported by most of the related bodies and provides a useful tool to monitor the performance of different projects with regards to their complementarity.

In the years ahead, further actions will be taken towards the building upon these initial achievements to implement the Strategy and the commitments stemming out of it.

1 Background and Introduction

1.1 Why we focus on ITS

Mobility is a key social need and is a prerequisite for economic and social development. As mobility needs grow dynamically, it is now necessary to manage the - continually growing - transport volume in a sustainable and environmentally and socially equitable way.

The quality of life and the protection of the environment at urban areas rely, among others, on an effective transportation system and have become a primary objective for both central government and local authorities, all over the world, during the last two decades. More especially, the provision of a safe transport environment is of great importance, in order to meet the aforementioned objective.

Improving road safety levels, with a particular view to reducing accidents is both a strategic objective and a key national priority of Greece. In particular, an important element for reducing accidents is to improve traffic flow using intelligent traffic management systems, in order to help users travel under smoother conditions, reduce unpredictable behaviors and prevent traffic accidents. Traffic management systems, speed control and enforcement, the use of cooperative systems, e-Call and the provision of information to drivers about potential obstacles, hazards and weather conditions, can help prevent road accidents drastically.

Intelligent Transport Systems set the basis for greater advantages in the future, by reducing administrative costs, increasing productivity and competitiveness, strengthening the national economy, and social cohesion and improving quality of life. For these reasons, Intelligent Transport Systems should become a key component of the future transport policy.

1.2 Background documents

As background documents we may consider the overall policy, technical and legislative documents that apply in the ITS sector, at national and EU level. More specifically, legislation that concerns ITS is depicted below and comprises, indicatively, the following pieces of legislation:

Subject	National Legislation	EC Directive
Framework for the deployment of Intelligent Transport Systems in the field of road transport and for interfaces with other transport modes	Presidential Decree 50/2012 (I/100)	2010/40/EU
Establishment of a procedure for the provision of information in the field of technical standards and regulations and of rules on Information Society services	Presidential Decree 39/2001 (I/28), as in force	98/34/EC
• Processing of personal data in ITS applications and services • Personal data protection In electronic communications sector Retention of data generated or processed in connection with the provision of publicly available electronic communications services or of public communications networks, use of monitoring systems to receive or record audio or video in public places	Law 2472/1997 (I/50) Law 3471/2006 (I/133) Law 3917/2011 (I/22)	95/46/EC 2002/58/EC 2006/24/EC

Subject	National Legislation	EC Directive
Rules on processing and use of road, traffic and travel data	Law 3448/2006 (I/57), Law 3613/2007 (Article 11) Circular ref. ΔΙΣΚΠΟ/Φ17/ off.13807 /20.6.2006 issued by the Ministry of Internal Affairs	2003/98/EC
Establishment of spatial information infrastructure for integrated access to travel data	Law 3882/2010 (I/166)	2007/2/EC
Interoperability of electronic road toll systems	Presidential Decree 177/2007 (I/216)	2004/52/EC
Harmonised provision for an interoperable EU-wide eCall		DA 305/12/EU
Provision of information for safe and secure places for trucks and commercial vehicles		DA 885/13/EU
Data and procedures for the provision, where possible, of road safety-related minimum universal traffic information free of charge to users		DA 886/13/EU

Table 1: National and EU legal framework for ITS

Furthermore, the reports already submitted to the EU according to the 2010/40/EU Directive outline the general background of this report. Namely:

- ITS Initial Report http://www.yme.gov.gr/?getwhat=1&oid=1271&id=&tid=1357
- ITS 5-year plan (Action Plan) http://www.yme.gr/getfile.php?id=4964)

These reports are concisely summarized below:

1.2.1 ITS Initial Report

In 2011, the Hellenic Ministry of Infrastructure, Transport & Networks submitted to the Commission the ITS Initial Report. The purpose of this document was to record the ITS projects already in place, according to the ITS Directive. This initial report was a first approach to a national inventory for ITS applications in Greece and became also an input to the ITS 5-year plan (ITS Action Plan 2012).

1.2.2 ITS 5-year plan (ITS Action Plan 2012)

The ITS 5 –year plan (National Action Plan for the development of ITS), was submitted by the Ministry of Infrastructure, Transport & Networks to the Commission in 2012, according to the requirements of the ITS Directive.

- This report was based on:

a) the national and European transport policy context
b) the particular geographical and economic characteristics of Greece
c) the national priorities
d) the initial report
e) the recording of the scheduled ITS projects in Greece by 2020

A first approach to identify the main strategy objectives was taken, and a set of strategically required actions (Action Plan) were launched in the context of the 2012 ITS Action Plan, to trigger the development of an integrated framework for the operation of ITS in a coordinated and consistent way.

1.2 What is this report about?

In 2014, Greece will have to submit to EU/DG-MOVE its progress monitoring report on all actions within the scope of the ITS Directive. The abovementioned requirement derives from the European Directive 2010/40/EU on the "development framework of Intelligent Transport Systems in the field of road transport and for interfaces with other transport modes" point 17(3) and follows on the reports submitted in the previous years.

This report focuses on the progress achieved in Greece during the past 4 years (2010-2013) in implementing Intelligent Transport Systems and Services. As the work in this field is ongoing, this report provides a snapshot of developments and trends to date, and serves as a baseline for future reports to be developed on a regular basis. Our authorities will continue to enhance aspects of monitoring and reporting in the coming years, drawing upon the experience and the conclusions from this report.

This is the first time that Greece is reporting collectively on the progress achieved in the ITS sector.

2 ITS Strategy and Goals

As one of the purposes of this report is monitoring the effectiveness of ITS applications with respect to the strategy objectives identified in the national and EU policy documents, we had to link the ITS achievements with the strategy goals, as set out in several policy documents. Below are presented the main strategy objectives, while the contribution of ITS applications to the respective areas is part of the analysis that takes place in Chapter 4.

2.1 National ITS Strategy & Architecture

In Greece, there is no National ITS Strategy already in place. Preparation of the first National ITS Strategy and ITS Architecture started in April 2014 and are being drafted at present time by a group of experts, with the coordination of the Ministry of Infrastructure, Transport & Networks. According to the time schedule, both the National ITS Strategy and National ITS Architecture will be completed by early 2015.

As a result, no actual strategy objectives have been designated up to now, yet there are several goals defined in the previous report submitted to the EU in 2012, titled ITS Action Plan[1] (5-year plan) and in other documents.

2.2 Strategic Goals

The **Intelligent Transportation Systems (ITS)** strategic area's overarching objective is to make transport safer and cleaner, but also to create knowledge on planning and implementing ITS projects as technology solutions that contribute to improving the efficiency and sustainability of transport systems in Greece.

The Strategy objectives and, ultimately, national priorities, as defined in the ITS Action Plan, are:

[1] Ministry of Infrastructure, Transport & Networks. http://ec.europa.eu/transport/themes/its/road/action_plan/doc/2012-greece-its-action-plan-2012-final_en.pdf

Nr	Strategy Objectives
1	Road Safety
2	Efficiency and effectiveness of the transport system
3	Sustainable mobility
4	Development, employment, social cohesion

Table 2: ITS Strategy Objectives

2.3 Other objectives

As reflected in the "ITS Action Plan" launched by the Commission with the goal to create the momentum necessary to speed up market penetration of rather mature ITS applications and services in Europe, the main policy objectives for transport and travel, arising from the challenges that the transport systems face, are to become:

- Cleaner
- More efficient, including energy efficiency
- Safer and more secure

Horizon 2020: "EU's plans for research and innovation funding (2014 to 2020)" identifies major strategic objectives that need to be taken into consideration in the design of a coordinated national approach. These are to:

- Eliminate fragmentation;
- Ensure coherence

The Commission proposes that future research and innovation funding will be based on three main areas that are firmly anchored in the Europe 2020 strategy:

- excellence in the science base;
- tackling societal challenges;
- creating industrial leadership and boosting competitiveness.

3 Our approach to the Progress Report

3.1 Measuring progress on ITS

Within the previous reports, a coordinated venture has taken place, in order to trace and list all projects, policies and trends related to ITS in Greece. Since there is currently no established mechanism such as a national ITS observatory, these results have not been recorded into a structured database, so that elaboration and monitoring would be facilitated. It is though considered that the acquired information has been a first step towards the setting up of an ITS inventory in Greece.

This report requires additional information, such as data and performance monitoring which, likewise, could derive from the ITS observatory or a national data warehouse. The establishment of a national mechanism for the monitoring of ITS will be initiated as a suggestion by the National ITS Strategy, which is currently being drafted.

To address the requirements of this report, an extensive research took place involving all parties who implement ITS within the scope of the 2010/40/EU Directive. This is a joint document authored by the staff of the Hellenic Ministry of Infrastructure, Transport and Networks, according to the requirements of the Directive 2010/40/EU, with the cooperation of the main Hellenic authorities and entities that implement, fund, monitor or simply use ITS. The data presented in this report have been collected from the authorities and entities and have been assessed, elaborated, classified and reviewed by the Ministry's stuff.

This Progress Report is officially the first document reporting progress in the field of ITS in Greece. This will become the basis and benchmark for future evaluations.

3.2 Methodology

In the context of this report, an extensive research was conducted for the collection of the required data. Since, as already mentioned, there is no such body like a national ITS observatory, the data was directly collected from a wide range of authorities and entities that implement, fund or use ITS, as well as with the support of major ITS providers across the country. Namely:

- Public or private authorities that implement ITS
- Supervisory bodies
- Road works Operators and concessioners
- Operators of other means of transport (interfaces with road)
- Managing Authorities
- TMCs
- Transport observatories
- Research and academic institutions active in ITS

Before applying the methodology to dozens of authorities/entities implementing ITS, it was important to standardize the expected outcome by the use of a model questionnaire, so that the received feedback would be as close as possible to the requirements of the Commission's guideline. Homogeneity of the received data was considered as a very important factor for the elaboration and the uniform presentation of the derived data. For this purpose, the Ministry of Infrastructure, Transport and Networks prepared a questionnaire which was sent to the authorities and entities and followed up with communication, where necessary, for the facilitation of the data collection and verification.

Based on the results received from this questionnaire, it was decided to classify the data by the use of appropriate taxonomy, according to the Commission's guideline. For the quality assurance and the accuracy of the provided information, all data tables and results were based on several assumptions, to ensure that the presented facts are accurate and pragmatic and the conclusions drawn, consistent.

- In general the following aspects are considered:

- Data shortage
- Lack of monitoring (KPIs, etc)
- Variance in the data assumptions
- Underreporting
- Many projects developed by the private sector, rendering them hard to trace
- The scale or the impact of the projects differ significantly

- The methodology of work was based on the following steps:

1. Identification of required data and sources
2. Identification of methodology
3. Questionnaire drafting and dissemination
4. Survey: Collection of information
5. Analysis: Data assessment and verification (quality assessment)
6. Synthesis: Elaboration of data, taxonomy (sorting by criteria) and integration
7. Conclusions & Next Steps

3.3 Collection of data

The Ministry of Infrastructure, Transport & Networks conducted a survey, in order to collect the information required for this report. All competent authorities were invited to participate to this survey by providing information related to the progress and performance of ITS projects, in the form of a questionnaire.

Qualitative and quantitative data was collected from the majority of the authorities, including the Athens Traffic Management Center, Attiki Odos TMC (both located in the Attica Region), Egnatia Odos, Motorway Operators, CERTH/HIT and other key ITS providers. Yet, a large part of authorities/entities that implement ITS did not provide their feedback to the survey, which results in missing pieces of information. Apart from underreporting, another problem that was encountered was inconsistency in data keeping and lack of synch among cooperating authorities, which was obvious in several cases, where i.e. two authorities provided different input on the same project. The latter can be attributed to the fact that there is no such thing as a standardized form for recording ITS projects. As a result, lack of synch and lack in data homogeneity was experienced. It was concluded that this problem can be addressed in the future with the establishment of permanent monitoring mechanisms.

3.4 What is being assessed?

The assessment is target based and is primarily concerned with the deployment as well as with the impact of the projects implemented. This first progress report is based on projects running in the 4-year period 2010-2013. Assessment focuses on the ITS projects in terms of investment, efficiency and impact. Apart from its direct benefits, it provides a foresight to the overall status, needs, trends and impacts, from the perspective of users, operators and the State. The need for further evaluation and the steps that need to be taken from the actors, also derive as conclusions of this assessment.

- According to the Commission's guidelines, the report should comprise information on:
    - Annual investments in ITS since 2010 in absolute values and in percentage (%) of the of total transport budget / infrastructure investment and per road network type
    - Performance assessment indicators (KPIs, etc), ideally segmented by strategy objective
    - Localization/maps of the deployment of ITS, ideally segmented by ITS core service

- Accordingly, the assessment consists of the following modules:

    1.1 Financial data monitoring
    1.2 Assessment of ITS performance
        1.2.1 per strategy objective
        1.2.2 per ITS provider/ITS core service
        1.2.3 localization data

When measuring the response of the systems, segregating the aspects of the several players is of utmost importance: For example, contribution to the societal goals of ITS cannot be measured, when assessing the economy of scale that ITS offer to the transport operator.

What matters most is to have a set of goals clearly predefined, so that progress monitoring is enabled. For this reason, the following goals have been identified and the survey has been conducted, based on the view of each group of interest, respectively.

- The involved groups of interest are:
    - Service users
    - Project owners
    - The State

➢ While, variables to be measured are:

- Travel time
- Travel cost
- Safety
- Convenience
- Other

The following matrix is formed:

Group of Interest	Travel time	Travel cost	Safety	Travel comfort	Other benefits
Service User					
Project Owner					
The State					

Table 3: TMCs Assessement

- o Another indicator to monitor the efficiency of investment in Safety Systems is:

SE=Reduction of Accidents / cost of investment

Additionally, the following indexes were surveyed for monitoring ITS performance:

1. Evaluation of TMCs (effect of ITS on traffic conditions)
2. Real-Time information provided on traffic incidents, road works, travel times, public transport information, other.
    a) to the public
    b) to companies
3. Data collection techniques used (cameras, loops, radars, Bluetooth, other)
4. Exchange of data
5. Traffic safety Accidents index (casualties per million vehicles/vehicle*km, severity weighted).
6. Traffic signal density (number of signals per road kilometers)
7. Traffic efficiency: Mobility index (minutes/km, weighted for public and private transport).
8. Localization/maps related to the above

3.5 Quality assurance of our assessments

Information presented comprises technical and economic data, research results, studies and field metrics and it derives from several sources:

- o The major TMCs
- o Motorway operators
- o Research institutes
- o Public transport organizations
- o Public and private bodies

In order to assure the accuracy of the provided data, data verification took place via internal audit and with the cooperation of the data providers, where it was deemed necessary.

To further assure the validity of the provided information, a detailed reference to the assumptions used is built-in in the context of each table comprised in this report.

3.6 How do we monitor our projects?

Since there is no established monitoring mechanism at national level, such as an ITS observatory or a data warehouse for monitoring the deployment of ITS (ie with the use of KPIs), this was done ad hoc by the Ministry's staff, with the cooperation of the authorities/entities involved. However, the National ITS Strategy will propose the necessity for the establishment of a monitoring mechanism, such as a national ITS observatory.

4 Implementation Status

4.1 Where we stand with ITS

There has been an effort to assess ITS projects impact with reference to a without-project case, which has been the case in the past, in the absence of any ITS investment of similar nature. Nevertheless, this could not be fully realized, due to a set of several other factors affecting the as-is case, namely changes in mobility due to the economic challenge, etc. Qualitative assessment for each criterion has been attempted per (major) ITS provider and for all projects as a whole.

TMCs have been able to better assess their ITS projects at individual level. The two major cities of Greece, Athens and Thessaloniki represent >50% of the entire population of Greece. Should their contribution be aggregated, the ratings could allow for an analysis at national level. But this aggregation is not allowed, due to the uneven spread of population and the particularities in the morphology of the Greek territory.

In order to achieve an effective performance assessment and to enable progress monitoring, evaluation of the core ITS services, provided by the main ITS providers, was attempted, according to the indexes and matrices set out in chapter 3.4. Ideally, we should have been able to perform this analysis based on the above analyzed specifications. However, it has not been able to collect the full range of the data that was surveyed. Major TMCs (like Athens TMC, Attiki Odos TMC and Egnatia Odos TMCs) have provided a qualitative evaluation of their overall portfolio, as a substitute for their ITS rating at this stage.

The analysis was conducted in two pillars:

- Financial
- Qualitative/Quantitative

The financial data is shown in the section 4.2: "Investing in ITS", while Quantitative/Qualitative information is provided in section 4.3: "Delivering the strategy goals" and 4.4: "Main ITS providers and core services".

The results of the analysis are presented below.

4.2 Investing in ITS

The advent of Intelligent Transportation Systems created opportunities for many players, including public authorities. The high return of investment that ITS offer is a fact, in both social and economic terms. The necessity for the modernization of the transport system, the integration of new technologies but also the increase of the transport system effectiveness and the competitiveness of the economy, the new business models available through ITS, create opportunities and the rise of mobility services (transition from *possession* to *use* - also in line with “mobility as a service”, the concept of the 10th EU ITS Congress in Helsinki).

ITS introduce a certain degree of rise into public investment and help societies achieve their goals of quality of life. Local communities, in particular, are central players in the ITS sector, active both in implementing infrastructure as in providing mobility services. R&D actions should also take advantage of the many optimization opportunities enabled by the information collected by vehicles and smart infrastructure, automated private/public vehicles and other probe data.

Ultimately, this optimization achieves gains in terms of fluidity of traffic, lower noise levels, free urban space, reduced emissions, reduced energy consumption, decreased accident rates and increased safety levels.

ITS offer a world of benefits. But the question that rises is: *Who will invest*?

Despite the recent economic challenge, ITS investments during the past 4 years have played an essential role in public sector investment, with the exploitation of EU structural funds, CEF - the new instrument of the EC for common interest projects in the TEN-T, as well as of private funds and innovative funding schemes, such as PPPs. In the latter case, by taking advantage of private sector innovation, experience and flexibility, the PPPs can often deliver services more cost-effectively than other traditional approaches. In the newly launched ITS projects of OASA – the Athens Urban Transport Organization (Telematics and Automated Fare Collection System) innovative procurement applies: funding will derive from private and structural funds.

The results of the survey that was conducted for this report, displaying the ITS investment in the last 4-year period (2010-now), is presented in the following tables.

4.2.1 ITS Investment per year and per type of Network

The following table shows the ITS investment that took place in the last 4-year period in Greece, categorized per year and per type of network, according to the EU guideline. We notice that there is a certain level of underreporting, especially concerning private funding, but also at certain levels of local government (ie Municipalities), where there is still limited awareness on ITS. The results of the survey and the assumptions used are extensively deployed in Annex I.

Budget (*1000€) / Type of Network	2010	2011	2012	2013	2014+	Total / Net. Type
1. Motorways	19822	7154	9181	10253	1255	**47665**
2. Urban	3966	2839	6080	5809	73491	**92185**
3. Urban & Interurban		79			1285	**1364**
4. National				597	500	**1097**
5. National & EU	100	255	266	150		**771**
6. Cross-Border				1079		**1079**
7. Multimodal_Railways	Internal Financial Resources					
8. Generic	545	320	320	78	926	**2189**
Total / year (*1000 €)	**24433**	**10647**	**15847**	**17966**	**77457**	**146350**

Table 4: ITS Investment /year /type of Network

4.2.2 ITS Investment per year and per Priority Area

Drawing upon the results presented in Annex I and the Priority Areas, as defined in the ITS Directive, the following allocation derives as investment per year and per Priority Area. In the case of more than one Priority Areas (P/A) per project, the estimation of budget allocation has been done proportionally.

Priority Area (P/A)	2010 (*1000 €)	2011 (*1000 €)	2012 (*1000 €)	2013 (*1000 €)	2014 + (*1000 €)	Total/PA (*1000 €)
I	7.820	3.835	4.425	3.823	58.954	**78.857**
II	4.095	1.340	4.760	5.695	7.352	**23.242**
III	10.669	4.246	4.004	6.293	894	**26.106**
IV	1.848	1.226	2.658	2.155	10.258	**18.145**
Total/Year	**24.432**	**10.647**	**15.847**	**17.966**	**77.457**	**146.350**

Table 5: ITS Investment /year/priority area

4.2.3 ITS Investment in major motorways (TERN)

In the case of the major motorways, concessions (PPPs) are the principal scheme for funding. These operators invest in ITS as their added value is proved, especially in what concerns road safety, quality services and high return of investment.

In the table below, the investment made in the last 4-year period as well as other characteristics of the projects are presented. The core ITS services that correspond to these investments are explicitly described in Chapter 4.4.

Motorway (1)	Total Length (km) (2)	ITS investm (2010-2013) (€) (3)	Total transport investment (2010-2013) (€) (4)	% of ITS/Total transport investment (€) (5) = (3)/(4)	ITS investment/ road length (€/Km)) (6) = (3)/(2)
Egnatia Odos	670	5.276.000,00	9.030.000,00	58,43%	7.875,00
Olympia Odos	215	1.401.000,00	-		6.516,00
Nea Odos (Ionia Odos & PATHE)	380	19.803.000,00	547.000.000,00	3,62%	52.113,00
Aigaion	235	2.626.000,00	-		11.174,00
Moreas	205	11.604.000,00	-		56.605,00
Attiki Odos	70	4.200.000,00	-		60.000,00
GRITS_ Greek Interoperable Tolling System (participating concessioners: Attiki Odos, Aegean Motorway, Olympia Odos, Moreas, Rion-Antirion bridge)	728	130.000,00			179,00
Total	**2.503**	**45.040.000,00**			**17.994,41**

Table 6: ITS investment in major motorways (TERN)

4.3 Delivering the Strategy Goals

4.3.1 Road Safety

Road safety is a top priority for Greece and also the main strategic objective of ITS. In this direction, the following actions are fostered:

- Use of traffic management systems for the improvement of traffic conditions
- Provision of information to road users
- Reduction of incident response time and deployment of the e-Call system
- Adoption of the ITS Directive (especially priority actions c & d) and Delegated Acts (305/26.11.2012**,** 886/15.04.2013)
- Incremental use of cooperative systems

Improving the flow of traffic with the use of traffic monitoring and recording technologies and advanced traffic management systems, allows road operators to customize speed limits and traffic signals and increase road networks capacity. As traffic flows easier, travel times are reduced and accidents are prevented. The provision of information to drivers about the road network (obstacles, hazards and weather conditions) is reducing unpredictable behaviours and incidents. ITS also help eliminate response time in case of incident, save lives and restore traffic promptly.

The case of Attica Tollway can be considered as a best-practice in Road Safety, was recently awarded the 1st Prize for Road Safety by the International Road Federation (IRF), in recognition of the quality road safety services provided to the Attiki Odos users. More specifically, according to official figures, the percentage of serious traffic accidents in relation to the vehicle kilometres driven on the Attiki Odos, is currently 3 to 4 times lower than in similar motorways in the country, while it is on the same scale as European motorways. Further examples of achievements in Road Safety levels are presented later in this chapter, in the analysis of individual cases of major ITS providers.

Greece follows strictly the objectives of the European Commission, by harmonizing the requirements of the ITS Directive and including Road Safety in high ranking on its policy agenda for transport. Road safety is also a key objective of the under development National Strategy for ITS. As a priority action of the Directive 2010/40/ EC (Article 3, action c) it will allow for the provision of information on road safety to end users. Providing traffic information on road safety is technically feasible and should be available to as many end users as possible. The reduction of road accidents and fatalities is the main expected outcome of this action for all citizens. The automated and continuous detection and recording through ITS of traffic hazards and accident black spots, will help control the conditions that cause incidents and finally eliminate them.

As mentioned in the explanatory memorandum of Delegated Act No. 886/15.4.2013 : “It is considered that the wide deployment of Intelligent Transport Systems (ITS) that can detect incidents, support traffic supervision and provide information to road users in real time, will considerably improve traffic safety (accident prevention). The human factor is the most important factor in accidents. Therefore, accurate and widely available road safety-related traffic information that can warn motorists and allow them to better anticipate and avoid unexpected and potentially dangerous situations has a high potential to reduce the number of traffic accidents. The overall effect of road safety-related traffic information is estimated to be an average reduction of 2.7 % in fatalities and 1.8 % in injuries, relative to all road accidents.. These figures vary depending on the road types and safety events to be covered by the service”.

On the other hand, the e-Call system, when fully deployed, will immediately notify emergency services, even if the passenger is unconscious and is expected to expedite the arrival of emergency services by 40% in urban areas and by 50%[2] in rural areas. The e-Call system is expected to reduce deaths and severity of injuries. The e-Call system can also have a significant impact on reducing congestion caused by road accidents and therefore, the on the overall congestion on European roads, thus reducing secondary accidents.

The above mentioned advantages can be further increased with the use of cooperative mobility systems (C-ITS). Future developments in safety and security systems will be directly linked to those of C-ITS, which focus drastically on road safety issues.

4.3.2 Efficiency and effectiveness of the transport system

ITS enable great possibilities: they help reduce accidents, delays & cancellations and increase user satisfaction. Various sets of measures apply on different types of networks and on several priority areas of the ITS Directive, while they yield multiple benefits for the society and the economy. More generally, ITS help operators provide better transport services, which is instrumental to the overall transport system operation.

Mobility management through ITS comprises information & traffic management applications and systems that contribute to the optimization of transport planning and demand management.

All ITS applications are considered as catalysts to this end, dealing generally with:

- Traffic flow optimization
- Provision of R-T information to users
- Fleet management
- Encouragement of the use of public transport
- New operational models

An essential element in traffic flow optimization is managing the assets. The role of the TMCs is to monitor and manage traffic, in order to improve efficiency and optimize performance. Through ITS, the efficiency of transport networks is improved as it is possible to safely accommodate more passengers and cargo. This is a cost effective way to increase the capacity of the existing infrastructure.

Interoperability plays a key role to the efficiency of the transport system. Since 2009, Attiki Odos Motorway provides Real-Time traffic data to the Athens TMC on a constant basis, so that they become integrated at regional level and subsequently available to the users of the road network.

In the same direction, an Interoperable Tolling System (GRITS) is available to the users of Attiki Odos, Olympia Odos, Moreas, Aegean Motorway and Rion-Antirion Bridge, which allows for the use the same transponder at all electronic toll lanes of the participating motorways.

With the forthcoming advent of big data, a lot of information is made available and should be reached by all travelers when needed. Reporting on traffic conditions, incidents and weather increases safety drastically and allows managing authorities to make more rational decisions. Furthermore, with R-T information and users becoming providers of information on their own mobility patterns, closed transport technologies are opened to web-based technologies. As a result, better informed users make more responsible choices.

There is a growing trend in the proliferation of telematics for public transport fleets, already available in many cities, enabling sound information on arrival/departure times. Along with the upcoming ticketing/charging applications, these services increase customer satisfaction and promote the use of public transport.

The provision of real-time information on traffic conditions, as priority action of Directive 2010/40/EC (Article 3, action b) will allow for better travel planning and traffic management, both within cities and around them. It is also expected to reduce congestion in urban road sections mainly and allow for the maximum utilization of the available road infrastructure to accommodate traffic peaks. The expected savings in travel time and the reduction in fuel consumption, along with the environmental and

[2] Commission Communication of 14 September 2005: The Second eSafety Communication - "Bringing eCall to Citizens" [COM(2005) 431final - Not published in the Official Journal].

economic benefits and ultimately the increased user satisfaction due to reliable and timely information, are the expected results of this action for citizens.

The abovementioned benefits are even more evident in the case of logistics hubs as well as in fleet management authorities (buses, trucks, touristic coaches). In the freight transport sector, fleet management with the use of telematics and route optimization applications enhance the effectiveness of the industry, where time and energy savings are critical. Ultimately, ITS help save cost, affecting the prices of products and services

Furthermore, ITS provide for the deployment of new operational models: consolidation of shipments via electronic platforms for the reduction of empty-running (less than truck load), new mobility schemes like car-pooling and car-sharing are new operational models available through ITS, with multiple benefits for the entire system.

4.3.3 Sustainable mobility

If there must be two clear priorities towards a green and cost-effective transport system, these are:

- reduction of the negative impact of transport to people and the environment
- savings in time and cost.

These two objectives don't always sit well together but, for the purpose of delivering more sustainable mobility, these compelling challenges need to be addressed.

To this end, ITS provide a set of ongoing improvements, focusing on transport operations and technologies. New operational models, optimization methods and cooperative systems deliver safer, more efficient and environmentally sustainable mobility and help prepare ex ante for tomorrow's greater challenges.

ITS applications achieve more sustainable mobility solutions by enabling commuters to shift from car use to public transport, especially in urban areas, where car is the dominant mode of transport. ITS realize this target by providing real-time information and by significantly upgrading the level of service.

Likewise, in the freight transport sector, multiple shipments are consolidated through ITS to avoid unnecessary vehicle*kilometres and save energy. In both cases, a drastic reduction in fuel consumption and reduced emissions are reached.

As in the case of TRAINOSE, where the TRAINOTAXI and ICS door to door passenger and freight transport services apply, it becomes evident that ITS are great enablers of multimodal transport. Applications at transport interchanges usually have this effect as multimodality enablers, rendering the transport system more sustainable in terms of cost, emissions and safety.

The increasing use of cooperative systems implies many features and benefits. Among others, C-ITS promise to effectively minimize crashes and emissions. The Compass 4D project undertaken by 7 European cities (among which is the city of Thessaloniki), uses C-ITS with the aim to promote road safety, energy efficiency and congestion reducing measures.

In the same direction, ITS will promote green transport by providing Real -Time information on the available parking/charging spaces for Electric Vehicles, eliminating "range anxiety" and promoting green mobility in urban areas, where it is mostly needed.

Many direct and indirect gains stem out of the extensive use of ITS. One example is the facilitation of the internalization of the external costs of transport that can be attained through the use of ITS.

4.3.4 Development, employment, social cohesion

A great development advantage of Intelligent Systems is their multiplier effect on the economy. Direct development advantages involve, among others, the following areas:

- “Green” jobs
- High technology development
- Communications and information technology
- Electronics and telecommunications
- Data processing and management services

whereas the implementation and deployment of ITS set the foundation for greater future benefits, including:

- Reduction of public expenditure;
- Increase of the national economy productivity
- Increase of competitiveness
- Improvement of the quality of life

The contribution of ITS in the protection of life and assets becomes apparent, especially if valuation of the cost of negative impacts (like crime or accident) is attempted. With safety and security systems that comprise special equipment (cameras, CCTV, GNSS, DSRC) installed on road or on specific sites for monitoring and control, safety and security of people and assets is improved. Moreover, Safe and Secure Truck Parking, as a priority action of the Directive 2010/40/EU, is instrumental in tackling crime, particularly in the freight transport sector.

But what is mainly sought through ITS, in this respect, is to develop cutting-edge technology, increase productivity and derive environmental benefits. According to studies, each 1 € invested in ITS for management and information systems in urban areas, results in gains of the range of 26€ to 41€ [3] by reducing:

- Travel time and cost
- Energy consumption
- Air pollution

The high efficiency and multiple benefits of ITS investments can be considered as incentives for attracting private funds. Modern funding schemes (like PPPs) are promoted, where the participation of the private sector can often deliver services more cost-effectively, by taking advantage of the private sector innovation, experience and flexibility.

Through the modernization of working practices, which is also a benefit that ITS enable, the level of production chain functionality increases, the overall system performance is improved and the cost, even that of the public sector, is reduced. Better control of businesses (e.g. ticket control), generates direct benefits for the companies. Inequalities due to territorial discontinuity are smoothed because transport, as a social right, is becoming more and more accessible to all regions of the country.

4.4 Main ITS providers and provided core services:

A separate taxonomy for recording the results of this survey is per major ITS provider/ITS core service. The major ITS providers are as follows:

1. Athens TMC
2. Attiki Odos TMC
3. Egnatia Odos TMCs

[3] *The overall cost-benefit analysis in the bibliography is 1:9, while there is a reference for 1:38 in urban road network*

4. Motorways (Concessions)
5. Urban Transport Organizations
6. CERTH-HIT
7. Intermodal Services

Their input is presented below.

4.4.1 The Athens TMC: The case of Athens Traffic Management Centre

Due to the fact that almost 50% of the population of Greece lives in the Prefecture of Attica and -since there is no established mechanism for the monitoring of the effects of ITS in transport in Greece, such as an observatory- we will focus the analysis on the data provided by the Athens TMC. These data cannot be aggregated though in order to extract conclusions for the entire country, since the population and the morphology of Greece do not allow for a uniform application of the derived results.

- **Introduction**

The Athens Traffic Management Centre (ATMC) of the Prefecture of Attica became operational in July 2004. Since then, it operates 24 hours per day, 365 days per year and its main apparatus includes 550 monitoring positions (75% of which are single inductive loops and 25% of which are Video Detection loops), 216 CCTV control cameras, 24 Variable Message Signs (VMS), the SITRAFFIC CONCERT software (where all the traffic data are processed), traffic lights' controllers in the signalized intersections for the communication between the 1,100 signalized intersections and the ATMC, 1 control room with 10 workstations, 1 video-wall, 42 monitors for the screening of the CCTV cameras and the appropriate telecommunication network. The primary objectives of the Centre are:

- Traffic optimization of the most heavily loaded urban roads of Athens
- Provision of travel time information to the drivers via Variable Message Signs
- Quick incident response
- Collection, analysis and use of the traffic data (traffic flow, time occupancy, average speed) collected from the 500 monitoring positions
- Real-time intervention in the traffic signal programs
- Supply of real-time data to providers for real-time information to the drivers

The Athens Traffic Management Centre is currently **the main ITS operator** in Greece. Traffic management is achieved primarily through the use of Intelligent Transport Systems and namely through:

- use of Variable Message Signs
- interventions in the signal control strategies.

- **Use of VMS**

The Athens Traffic Management Centre uses the 24 Variable Message Signs for three types of messages; Immediate and Advance Warning, Travel-time Information and Public Service Announcement messages. These 24 VMS are illustrated in the following Figure (Figure 1):

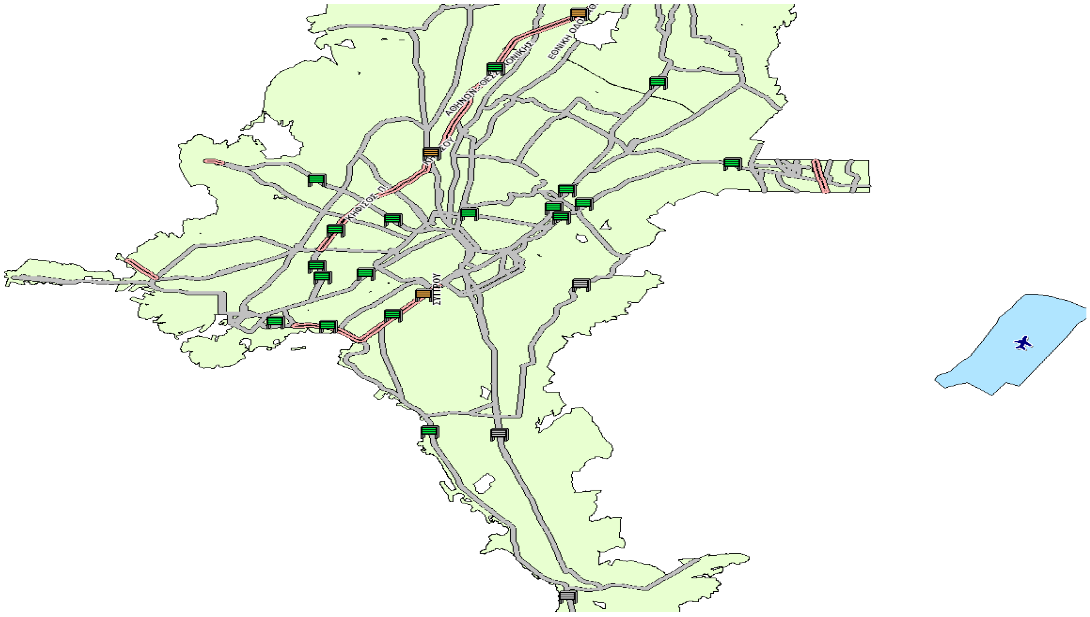


Figure 1: VMS locations in the Athens area

- Immediate and Advance Warning messages provide information to the driver for incidents which are either unexpected (such as accidents, demonstrations, broken-down vehicles and extreme environmental conditions) or programmed (such as road closures, construction and maintenance sites).
- Travel-time Information messages provide real-time information to the drivers on the time needed to access specific destinations. Several routes are being monitored for each VMS, and the average time needed for a private car to reach the specific destinations is estimated.

The estimation of travel time for each road section is made by the use of algorithms which take into account the collected traffic data of traffic flow and average vehicle speed and also several traffic and signalization characteristics. Furthermore, information about possible congestion at specific traffic sites, which are considered to be important for the drivers passing through each VMS are also displayed.
There is a priority rule governing the use of the VMS messages. The Immediate and Advance Warning messages have the highest priority, the Travel-time Information messages have medium priority and the Public Announcement messages have the lowest priority.

- **Interventions in the signal control strategies**

The ATMC intervenes in the signal control programs of Athens in three different ways, namely:

a) Off-line interventions
b) On-line interventions
c) Implementation of optimized traffic responsive signal programs

The above methods and the impact that these interventions have on traffic, are described below:

a) Off-line interventions in the signal control programs

The off-line interventions in the signal programs take place in case the signal programs of the Weekly Automaton in specific intersections or networks do not correspond to the prevailing traffic conditions on a constant basis.

b) On-line interventions in the signal control programs

The ATMC has the capability of intervening on-line in the signal programs. This capability is very important in case of unexpected incidents that have a significant effect on traffic (such as road closure), but should be used very carefully since the vast majority of the intersections in a city centre is coordinated with neighbouring intersections and thus, an on-line intervention in one intersection might initially only have an effect on the traffic conditions upstream of the specific intersection, but after a while it might result in a deterioration of the traffic conditions of the whole network.

The effects of these on-line interventions on traffic conditions were monitored on-line primarily by the use of CCTV cameras and also by the analysis of the traffic counts. It must be noted that the time between the forwarding of the command to change the signal program on-line and the actual implementation of the new altered signal program is 3 to 5 minutes and corresponds to the time needed for the communication between the central computer of the ATMC and the traffic controller of the intersection plus the time needed between the acceptance of the command by the traffic controller and the switch over point of the signal programs.

c) Implementation of optimized traffic responsive signal programs

In cases of isolated intersections, an optimized signal control strategy has been developed which takes into account the particularities of vehicle movement in the city of Athens as well as the technical capabilities of the traffic controller which is used in Athens.

The philosophy of the adopted optimisation algorithm is to minimise delays and hence, an appropriate algorithm was developed which mainly takes into account the variable of density (in the form of time occupancy) to account for the current traffic conditions. The developed algorithm took advantage of the traffic counts of two measuring stations for each critical stream, to account for the demand of the critical stream and for the departure rate of the vehicles leaving the critical stream, respectively.

The intersections used involved heavy congestion during the vast majority of the day time. The results of the implementation of the optimized traffic responsive signal programs were obvious even by the use of CCTV control cameras and they were testified by the examination of the prevailing traffic conditions as estimated by the ATMC.

For the illustration of the effect of the aforementioned optimized signal programs on traffic, diagrams were used in order to compare the traffic conditions before and after the implementation of the optimized signal control strategy. Two different approaches were chosen (of the same intersection) and the appropriate diagrams were produced to illustrate the traffic conditions **before** and **after** the implementation of the optimized traffic responsive signal control strategy.

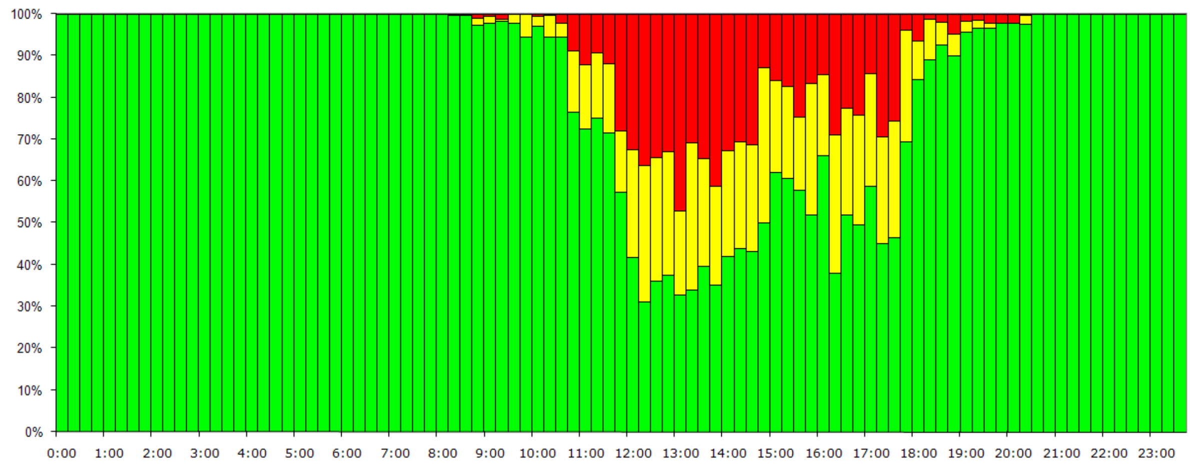


Figure 2 – Traffic conditions of approach 1 (before the implementation of the optimised traffic responsive signal control)

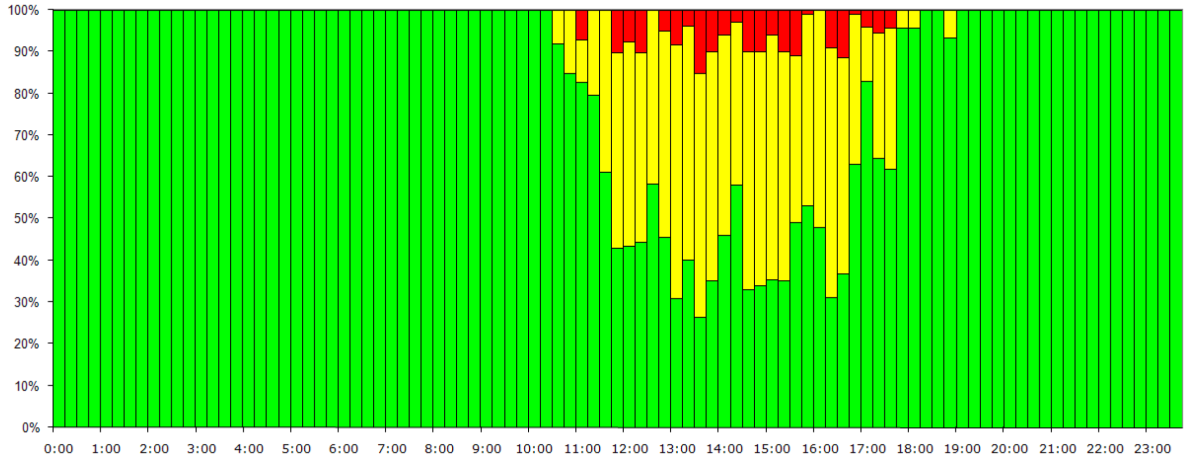


Figure 3 – Traffic conditions of approach 1 (after the implementation of the optimised traffic responsive signal control)

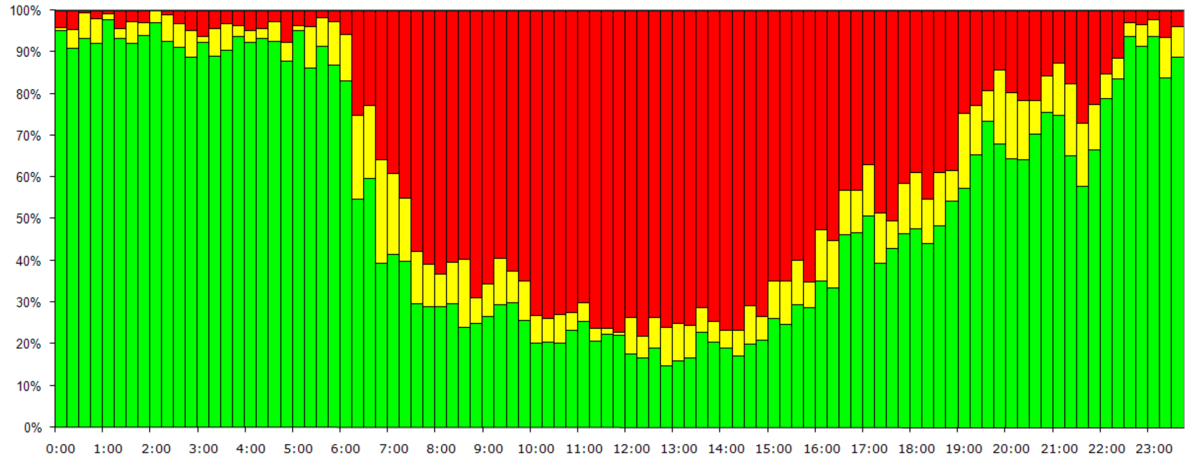


Figure 4 – Traffic conditions of approach 2 (before the implementation of the optimised traffic responsive signal control)

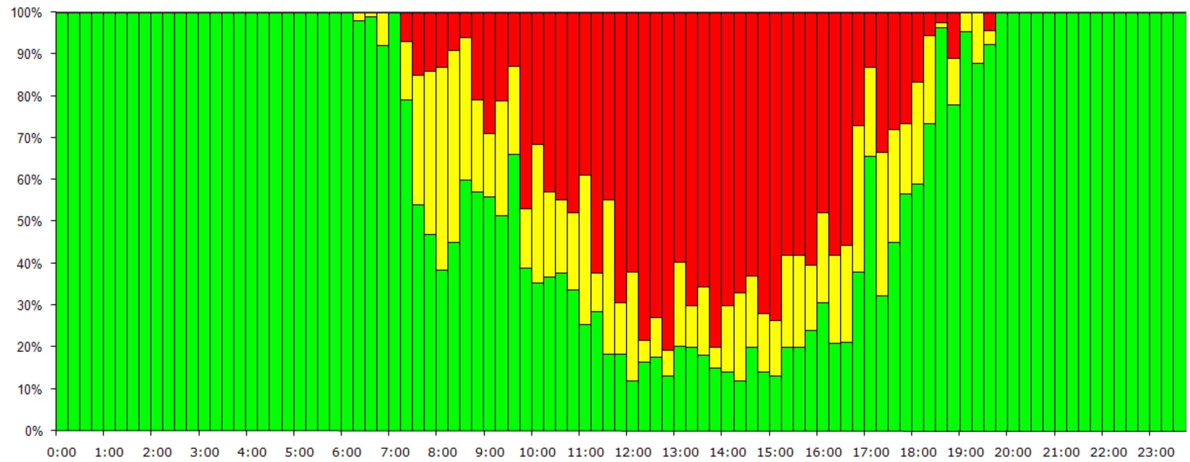


Figure 5: Traffic conditions of approach 2 (after the implementation of the optimised traffic responsive signal control)

The comparison between the four diagrams shows that in both cases the traffic conditions of the two approaches improved significantly. The heavy traffic conditions time intervals decreased and moreover, the analysis of the traffic data indicated an increase in traffic flow (ranging from 10% to 15%) and an increase in average vehicle speed (ranging from 15% to 20%).

It is important to clarify the reason for the differences between the two diagrams – in the case after the implementation of the optimised traffic responsive signal control method – for the two approaches (Figures 3 and 5). The reason for these differences (in the approach of Figure 5 the heavy traffic conditions time intervals are substantially more than the corresponding ones of Figure 3) involves traffic policy criteria. In this specific intersection, heavy congestion on approach 2 results in queues which spill back and have an effect not only on the exit ramp of the highway but also on the main direction of movement on the highway. At the same time heavy congestion on approach 1 does not have an effect on the main direction of movement on the highway, but only on a secondary road and thus, the traffic policy criteria favoured approach 1.

- **Effect of the ATMC operation on Traffic Conditions**

The effect that the ATMC operation has on the prevailing traffic conditions, has been estimated by a number of studies which have been either carried out by the traffic engineers of the ATMC – and the vast majority of those have been published – or by the help of students of the National Technical University of Athens. More specifically:

1. "The use of Variable Message Signs by the Athens Traffic Management Centre" (ATMC, NTUA, 2006).

On 16th December 2005 (Friday), Mesogeion Avenue was closed down at around 11:30 due to a suspect package in front of the Ministry of Defence (Figure 6).

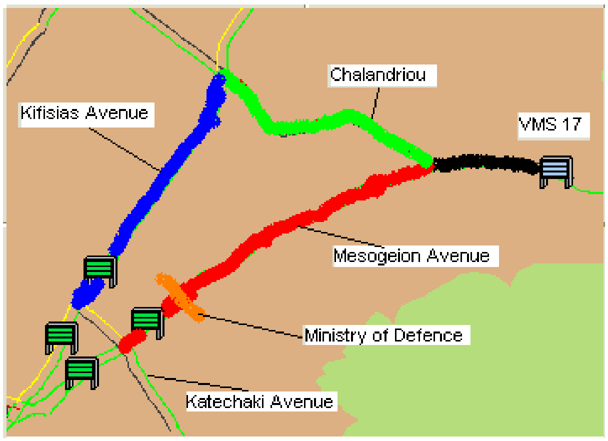


Figure 6: Illustration of the two routes of VMS17

The Athens Traffic Management Centre informs the drivers passing from that point through VMS17. This VMS provides information to the drivers about two routes. When the incident was spotted, an Immediate and Advance Warning message was sent to VMS17 informing the drivers about the closure of Mesogeion Avenue in front of the Ministry of Defence. This message did not suggest any alternative routes. The incident was cleared at 12:15 and at the same time the Immediate and Advance Warning message was changed to an automatic Travel-time Information message.

The ATMC made a before and after analysis to estimate the driver's response to the incident. The traffic data collected on that day were compared to the corresponding traffic data collected from the same loops for a typical Friday (average values of all Fridays over a period of two months). The analysis showed that in the common road section, no statistically significant change was evident. On the other hand, the traffic data collected from the first route (after the common road section) indicated that there was a 40% decrease in traffic flow. At the same time, the traffic data collected from the second route indicated a slight increase (10%) in traffic flow. This increase could not have been higher because in that route the road operates close to its capacity level during that time of the day.

Hence, the big influence of the 40% decrease of traffic flow in the first route could not be found in the excess traffic flow of the second route, but only in the decrease of the average vehicle speed in the second route, which was about 15%. This decrease resulted in a substantial increase in the travel time of the second route, which can be seen in Figure 7.

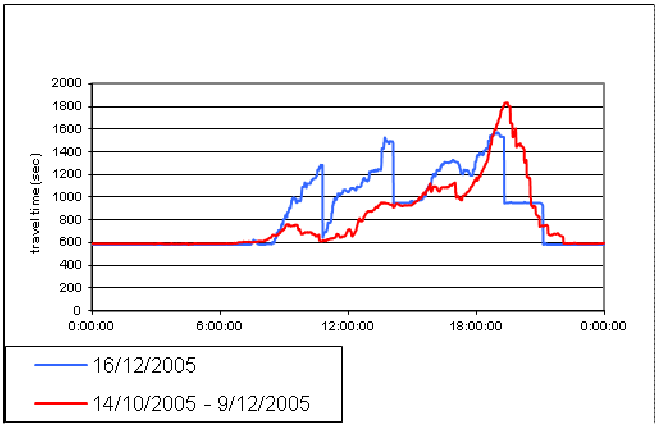


Figure 7: Travel time distribution of the second route

The range of the travel time increase was 30% to 60% and lasted until 14:00 indicating that it took a lot more time than the actual clearance time of the incident for the travel times of the second route to get close values to those of a typical Friday. Further analysis of the traffic streams of the last intersection of the common road section of the two routes indicated that the 40% decrease in traffic flow of the first route corresponded to 60% of the drivers that passed from VMS17 with a destination involving the first route. That meant that at least 60% of the drivers passing by VMS17 were informed by the Immediate and Advance Warning message and decided to change their route. This 60% value is even higher than the percentage estimates of similar studies. For the precise estimation of the drivers that read the message, the number of drivers that could not change their route (because of their final destination) and the number of drivers that did not precisely know the road network (and hence, they could not use an alternative route) is necessary but it could not be estimated.

2. *"The Impact of VMS on Drivers' route choice in Athens"* (ATMC, NTUA, 2007)

On 12 March 2006 (Sunday), at 13:30, a substantial pavement collapse took place in Kifisou Freeway. Traffic Police closed down two of the three lanes and the Athens TMC sent an Immediate and Advance Warning message to 10 VMS (on Kifisou Freeway and on all arterial roads which could be used by drivers travelling to Kifisou Freeway) to inform drivers about the incident and its implications. Drivers travelling on Kifisou Freeway with destinations near the incident have two alternative routes. The first one involves Acharnon Avenue in conjunction with Kifisias Avenue (blue and orange colours in Figure 3). The second involves Attiki Odos in conjunction with Kifisias Avenue (green and orange colours in Figure 3). It should be noted that Attiki Odos is a privately owned toll operated freeway.

Figure 8: Illustration of alternative routes

Due to the severance of the pavement collapse it was decided to close down all the lanes of Kifisou Freeway downstream of Acharnon Avenue and all vehicles were diverted to Acharnon Avenue. The ATMC sent an Immediate and Advance Warning message to 10 VMS informing drivers about the closure of Kifisou Freeway and the diversion via Acharnon Avenue. This diversion quickly led to traffic congestion in Acharnon Avenue and therefore, Traffic Police was forced to re-open one lane of Kifisou Freeway at the location where the collapse took place. The severity of the incident, led to discussions between the Traffic Police, ATMC and the operator of Attiki Odos, to prevent extensive traffic congestion. It was decided for drivers to use Attiki Odos toll free, in order to extensively use this freeway as an alternative route. ATMC informed drivers about this development. At 17:00, the pavement collapse was partially rectified and vehicles were allowed to use two out of the three lanes. Hence, the incident was gradually cleared.

ATMC used the traffic data collected from the loops to estimate (by means of a before and after analysis) the effect of that incident on traffic. The traffic data for a typical Sunday (average values of Sundays over a period of two months) were compared to the corresponding values of that day. Due to the fact that the incident took place on a Sunday, the effect that it had on traffic was less severe than it would have been had it taken place on a weekday. More specifically, the decrease in traffic flow on a typical Sunday compared to a typical weekday is 35% at 13:30 increasing to 50% until 17:00. The analysis indicated that:

a) The most substantial changes in traffic flow took place in Kifisou Freeway. In the section between Acharnon Avenue and the Biological Centre there was a 60% to 80% decrease in traffic flow and a 40% decrease in average vehicle speed. Upstream of Acharnon Avenue there was a 30% to 50% decrease in traffic flow and a 40% decrease in average vehicle speed. It was estimated that an 8km queue was formed.
b) In the exit towards Acharnon Avenue there was a 100% traffic flow increase. In the exit towards Attiki Odos there was an initial traffic flow decrease of about 70% (before the tolls deration of Attiki Odos) and a 100% traffic flow increase (during the toll free operation of Attiki Odos).
c) Kifisias Avenue had an about 20% increase in traffic flow (due to drivers that used Kifisias Avenue as an alternative route)
d) In the arterial roads leading to Kifisou Freeway, there was an about 20% decrease in traffic flow in the exits towards Kifisou Freeway indicating that these drivers were informed about the incident.

The most important factor contributing to the magnitude of these changes was that the incident occurred on a Sunday, when the elasticity of the trips is high, since the prevailing trip purpose is leisure. Therefore, many drivers were informed about the incident and decided to change their destination or cancel their trip altogether.

3. "Effectiveness of Travel-Time Information Messages on Driver Behaviour"

A large scale questionnaire survey was undertaken to capture the characteristics of trips performed in the city of Athens. Part of this survey involved driver attitudes towards the ATMC variable message signs. The duration of the study was two months and the final sample size consisted of 7.939 drivers.

distribution of the sample size across the different vehicle categories	
passenger cars	74%
power-two-wheelers	17%,
taxi	2%
heavy goods vehicles (HGV)	7%

Table 8: Distribution of the sample size across the different vehicle categories

In addition, to the vehicle category, the location where the interviews took place was also noted. The reason for this is to see whether there is any correlation between driver attitudes and the specificities of the operation of particular VMS.

As noted, part of the questionnaire involved driver attitudes towards the VMS. In particular, drivers were asked two questions:

1. Do you read the messages displayed on the VMS?
2. If yes, are they of use for your trips?

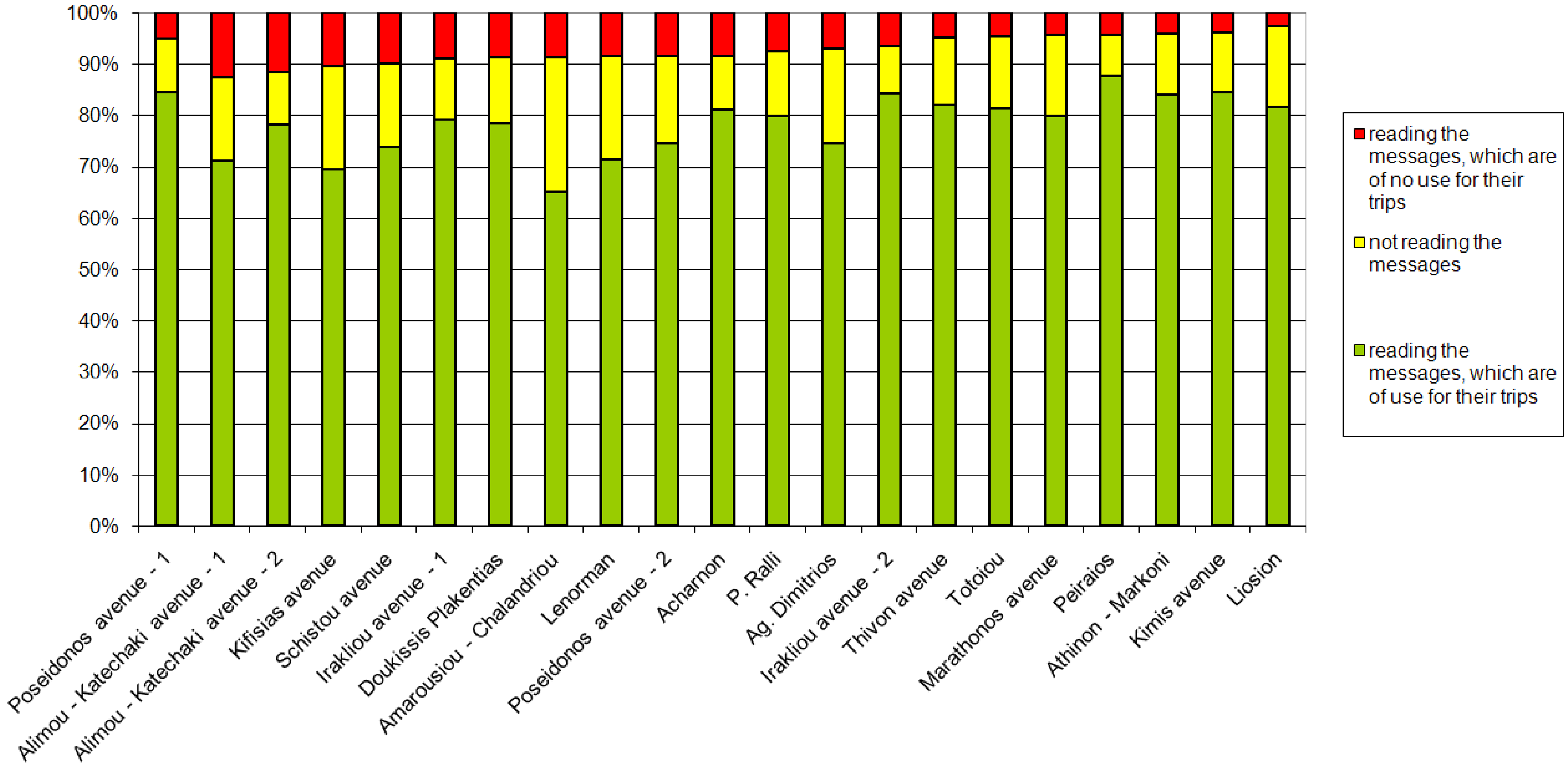
For the first question, if the answer is ‘no” this can be a result of two distinct attitudes. The first involves ignorance of the VMS system, as drivers might not notice them (although the VMS have been in operation since early 2005). The second involves perceived reliability issues. In this case, drivers are aware of the existence of VMS but do not think they are useful mainly because they find the information unreliable. Hence, it is safe to state that the drivers that do not read the info displayed on the VMS have negative attitudes towards the systems.

For the second question, if the answer is “no” it could again be a result of two attitudes. The first involves drivers who do not trust the messages displayed via the VMS (the majority of such drivers would have answered “no” in the first question). It *is safe to assume that someone who does not trust the system would not read the VMS.* The second involves drivers who cannot modify their trip characteristics (mainly route choice) based on the received information (inelastic trip characteristics or routes different from those included in the transmitted messages). Nevertheless, a negative answer in the second question does not reveal negative attitudes towards the system, but could raise issues of message appropriateness for these VMS

The results of the questionnaire survey are illustrated in Figure 9:

Figure 9

Drivers attitutes per location



- **Effect of the ATMC operation on Road Safety**

Among other activities, road safety research using traffic and incident data from the Athens Traffic Management Centre is carried out. This research concerns research papers, diploma theses or internships carried out by students and the personnel of the ATMC. Some characteristic examples are the following:

1. "Analysis of road accident risk for Kifisos motorway, using data from the Athens Traffic Management Centre", published in the proceedings of the 5th Pan-Hellenic Road Safety Conference, (ATMC, October 2012).

The paper investigated the road accident risk (number of accidents per billion vehicle kilometres) per road segment for Kifisos urban motorway, based on the number of accidents and the respective number of vehicle kilometres travelled. In this way, indicators concerning road accident risk per road segment were obtained for a series of years and thus the identification of hazardous segments was enabled. The analysis aimed to support decisions concerning road safety interventions across Kifisos motorway and assist in the understanding of the correlation between local geometrical or traffic characteristics with road accident risk.

2. "Correlation of traffic characteristics with road accident severity and probability" Diploma Thesis, by Apostolos Ziakopoulos, (March 2013).

In this Diploma Thesis, data concerning the road accidents occurred on Kifisias Avenue in Athens, Greece, during the period 2006 - 2010 were collected from the ELSTAT database with disaggregate data. Subsequently, traffic data (volume, speed, occupation) were obtained from the Traffic Management Centre of Athens. For the analysis, logistic regression mathematical models were developed. The application of these models indicates that road accident severity is correlated with the logarithm of traffic density, the type of vehicle and the type of accident. When data are separated in two groups of peak and off-peak hour accidents, the parameter of traffic density is the only one appearing to be statistically significant. Furthermore, traffic volume is the only parameter found with a statistically significant impact on accident probability.

- **Traffic Data**

It must be strongly pointed out that the Athens Traffic Management Centre does not develop infomobility services. The traffic data as collected (traffic flow, density, average vehicle speed and traffic incidents) and analyzed (traffic conditions, travel times) by the Athens Traffic Management Centre are sold to third parties which might be interested to develop their own infomobility services. To the best of our knowledge, currently there is only one company which makes use of these data and information.

Finally, it must be said that the Athens Traffic Management Centre also uses the raw traffic data from Attiki Odos (in XML format) and further analyses them (by the use of the ATMC's algorithms) to also estimate the traffic conditions in the most wide area possible in the region of Attica.

4.4.2 Egnatia Odos

4.4.2.1 TCCs Operation - Data and Indices

To assess the benefits of using ITS in Egnatia Odos Motorway, a recent data analysis is given below, comparing the accident rates in both monitored and non-monitored by the TCCs motorway sections, were active traffic management through ITS takes place. The data presented below will be published in the PIARC ROUTES / ROADS journal in October 2014

- <u>Analysis of Traffic Control Centers Operation Data of EGNATIA ODOS</u>

Operation data collection and analysis can help demonstrating the benefits of TCC activities and identifying and documenting problems with TCC operations or operational procedures which should be addressed to improve their efficiency and optimize performance [FHWA, 2013]. The following basic analysis is based on two year data from a cluster of «Egnatia Odos» TCCs. These TCCs monitor mainly motorway sections with large tunnels at mountainous areas and therefore any conclusions should be drawn accordingly.

Table 9 presents the proportion of incident types recorded by TCCs. The incident type most often recorded are the “stopped vehicle” (41%) followed by “slow moving vehicle” (12,6%). 9% of incidents are related to extreme weather conditions. Interestingly, only 3,2% of incidents involve an accident.

Incident description	Proportion
Pedestrian on the road	11,0%
Cyclists on the road	1,9%
Animal on the road	4,6%
Slow moving vehicle	12,6%
Stopped vehicle (breakdown, tyre failure, gas, etc)	41,0%
Over-height vehicle	4,7%
Dangerous driving (wrong way, 180° turn, etc)	1,9%
Accident (with casualties and/or material damages)	3,2%
Vehicle fire/smoke	1,0%
Smog/pollution in tunnel	0,8%
Obstacle on the road	3,7%
Road works (maintenance, etc)	4,0%
Reduced visibility (i.e. fog)	5,1%
Strong winds	2,5%
Heavy rain	0,3%
Heavy snow	0,9%
Other	0,8%

Table 9: Proportion of incidents managed by TCCs

Table 10 presents the proportion of TCCs operators’ actions after the detection of an incident. The most frequent actions are to inform the Emergency Patrol (63,3%) followed by application of traffic management for lane closure (35,9%).

TCC operators’ actions	Proportion
Call Fire Agency	0,3%
Call Traffic Police	12,6%
Call Ambulance	0,5%
Call Emergency Patrol	63,3%
Call Maintenance crew	8,9%
Lane closure	35,9%
Road/tunnel closure	2,6%
Flashing traffic lights	12,5%
Speed reduction (VSLS)	3,4%
Message through VMS	12,2%
Message through tunnel PA (loudspeaker)	12,5%
Message through tunnel phone box/booth call	0,9%
Activate tunnel ventilation system	1,3%

Table 10: Proportion of TCC operators’ actions

Table 11 presents the percentage of incident detection means at TCCs. It must be noted that only the first source of information is recorded. The vast majority (86.8%) of incidents are detected from the cameras of the CCTV system.

Detection means	Proportion
CCTV	86,8%
Road users call to emergency phone number (1077)	5,6%
Road users call from roadway/tunnel emergency phone	0,5%
Information from Toll station	0,2%
Information from Traffic Police	0,1%
Information from Emergency patrol	4,1%
Information from other TCC	0,7%
Other	2,0%

Table 11: Proportion of TCC incident detection means

- **TCCs Role in Road Safety Improvement**

A comparison between road safety levels of motorway sections that are monitored by TCCs with other non-monitored sections is attempted next. It should be noted though, that the initial criterion for the decision to systematically monitor a road section is the existence of safety particularities, either concerning the infrastructure (tunnels, urban highways etc.) or the traffic (volume, accidents etc).

However, not all road accidents are being recorded by the responsible authorities (Police, road operator etc.) and this underreporting should be taken into account when performing a reliable evaluation of the impact of TCCs on safety. The degree of underreporting can be quite large, and it varies according to characteristics such as injury severity and road user type [Amoros et al, 2006] and decreases with increased severity. In making reliable road safety comparisons, it is necessary to apply correction coefficients to the recorded road safety indices to avoid overrepresentation of TCC monitored sections where it is expected that the majority of incidents will be recorded as opposed to not permanently monitored road sections where large proportions of incidents, mainly involving low severity accidents, are not recorded. Based on the meta-analysis of incomplete accident reporting [Elvik and Mysen, 1999] and taking into account that motorway incidents involve predominantly car users and that serious injury accidents are 10% of all injury accidents, the following reporting levels and corrective coefficients are assumed, Table 12.

Incident type	Sections w/o TCC	Corrective coefficient	TCC sections	Corrective coefficient
Fatal accident	5%	1,05	1%	1,01
Injury accident (slight & serious)	50%	2,00	15%	1,18
Property damage only	70%	3,30	20%	1,25

Table 12: Corrective coefficients for incident under-reporting based on incident severity, under-reporting percentage and monitoring level.

Table 13 presents the recorded and corrected Road Safety Indices for different motorway sections (TCC-monitored and w/o TCCs). Indices are also calculated for a particular road section without TCC but with geometrical characteristics partly similar to road sections that are monitored.

Road Sections	Length (km)	Recorded indices per billion (10^9) veh*km					"Corrected" indices per billion (109) veh*km				
		Fatal accident	Injury accident	Material damage accidents	Total accidents with casualties	Total accident	Fatal accident	Injury accident	Material damage accident	Total accidents with casualties	Total accident
With TCC (road sections with tunnels in mountainous areas)	166	4,2	27,5	166,8	31,7	198,5	4,3	32,4	208,5	36,7	245,2
W/o TCC (mostly straight sections at flat areas)	922,6	4,7	40,9	135,1	45,6	180,7	5,0	81,7	445,8	86,7	532,5
W/o TCC (curved sections at mountainous areas)	44,6	7,2	79,4	433,2	86,6	519,8	7,6	158,8	1429,5	166,4	1595,9

Table 13: Road Safety indices for motorway sections with and without TCCs

Fig.10 shows a percentile comparison of the road safety indices for the different road sections and type of incident by considering as baseline the indices of motorway stretches with TCC.

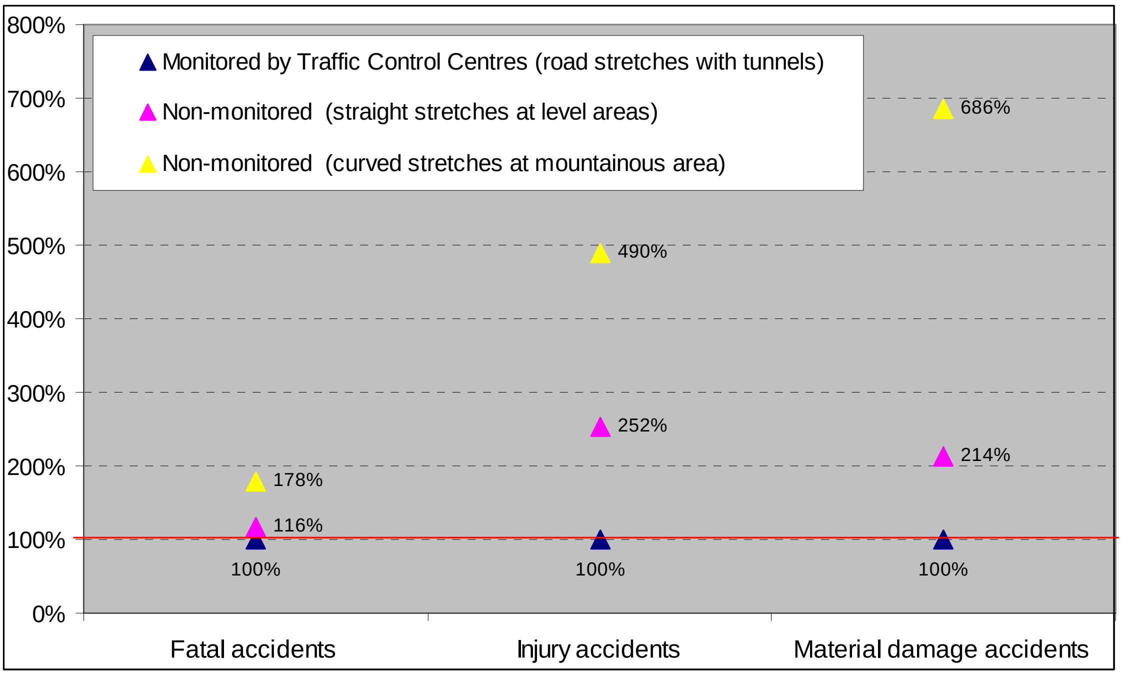


Fig.10: Road safety indices rates between sections with and without TCC

- **Traffic Monitoring and Recording Technologies**

Automated monitoring and recording of traffic on Egnatia Odos motorway is performed with a multitude of instruments, depending on the specific technical and traffic characteristics of the road segments (eg successive tunnels, open road sections, etc). Information transfer is carried out with the use of adequate telecommunication networks (eg fiber optics or wireless connections through GSM/GPRS).

Indicatively, the following technologies for monitoring and recording are reported:

• Measurement of traffic volumes on the open road

  - inductive loop traffic counters in more than 20 road sections of the highway,
  - side fire microwave radar for traffic counting in 3 road sections of the highway,
  - light signaling regulators /controllers at 15 signalized intersections (connections of motorway interchanges with the rest of network)
  - crossing lane controllers in the 6 operating toll stations of Egnatia Odos
  - In-situ traffic measurements of short-term crossings of special vehicles (eg dangerous goods vehicles)

• Measurement of traffic volume in tunnels

  - with inductive loop traffic counters

• Traffic management cameras (> 900 CCTV)

Road Section				**Tunnels**	**Nodes &**	**TM**
Interchange		**Length**	**Nr.**	**Length***	**Semi-nodes**	**Cameras**
		(km)		**(km)**		
Igoumenitsa	**Ioannina**	*76,1*	*13*	*19,094*	*10*	*180*
Ioannina	**Arachthos**	*22,7*	*3*	*9,794*	*4*	*87*
Arachthos	**Peristeri**	*8,9*	*2*	*5,828*	*2*	*53*
Peristeri	**Mets**	*8,0*	*8*	*9,124*	*2*	*79*
Mets	**Panagia**	*13,7*	*7*	*15,098*	*3*	*162*
Panagia	**Grevena**	*27,2*	*13*	*21,432*	*3*	*218*
Polym	**Verroia**	*25,9*	*15*	*13,957*	*2*	*89*
Strymonas	**Ag.Andreas**	*42,5*	*1*	*2,280*	*3*	*28*
Komotini	**Nymfaia – Hellenic/Bulgarian Border**	*22,3*	*5*	*1,700*	*3*	*5*
						** dual-operating segment tunnel length*

Table 14: Allocation of TM Cameras over Egantia Odos

- **Real-Time information**

Through the Traffic Control Centres integrated traffic management software (Traffic Management Systems) in supervised road sections, real-time information is provided to the users of Egnatia Odos.

Information is provided (in Greek and English) on:

Warning Messages for road incidents and respective traffic regulations, include (without limitation):
Road obstacle (objects, stopped vehicles, etc.)
Accidents
Cross-run vehicle
Congestion
Road works (maintenance, etc)
Reduced visibility (eg fog)
Strong winds
Strong rainfall, snowfall
Other

General information messages provided via the following electronic media:
• VMS: Variable Message Signs (> 100 total)
• VSLS: Variable Speed Limit Signs (> 150)
• LCS: Lane Control Signs (> 500)
• Traffic Lights
• Public address loudspeakers systems in tunnels (25 total)
• FM Radio rebroadcasting systems in tunnels (25 total)

RWIS: Road weather information systems: (36 in total)
Messages related to weather conditions are based on data collected from the installed meteorological stations.

For the faster and most efficient management of potential road incidents on the monitored sections, the motorway is divided into designated control areas (ranging from 250m between consecutive LCS in tunnels, up to several kilometres in open road sections without electronic systems) and for each of them, depending on the type of incident, adequate traffic scenarios (traffic management plans) have been developed and may automatically apply, by order of the Traffic Control Centres operators. Each scenario includes all activities required to manage the incident, including:

Electronic signs (LCS, VSLS) and traffic lights settings, in order to achieve lane foreclosure (slow, fast) or traffic closure in one or both road operating segments, depending on the incident's magnitude for the overall segments which are affected by the incident.
Reporting related messages on the **VMS**.
Required **phone calls** from the TCCs operators, etc

- **Road Safety**

Indices on motorway safety are presented below, (published data from the Egnatia Odos observatory) (http://observatory.egnatia.gr/02_indicators/02_tra08.htm).

Indices on motorway safety are calculated on monthly and annual basis. The main indices used are the accidents per billion vehicle-kilometres (acc/10^9*veh*km), the accidents per km (acc/km) and the absolute accident numbers. The calculation of the safety indicators is based on the official recorded data of road incidents performed by the motorway operator through the safety patrol teams and the traffic control centres. Monthly rates are reported internally and annual rates are published publicly in the web/internet. Regarding the impact of ITS on road safety, it is possible to compare the road safety indices on road sections monitored and managed with ITS with sections without ITS. Such indices and comparisons have been recorded and published.

Based on the above analysis, the general road safety indicators are published annually by the "Egnatia Odos Observatory" (http://observatory.egnatia.gr/ - latest indices are only in Greek language). The latest main indices on fatal road accidents are presented in the following chart.

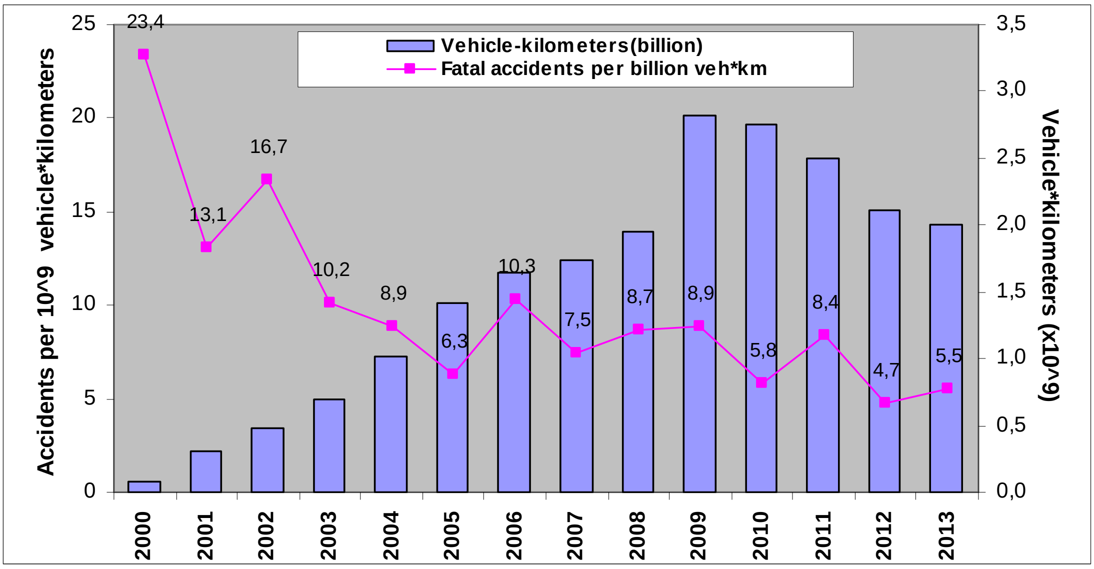


Figure 11: "Egnatia Odos" motorway accident rates

4.4.3 Major Motorways (TERN)

4.4.3.1 Attiki Odos Urban Freeway

Attica Tollway was founded in the year 1999 and is assigned with the operation and maintenance of the Attiki Odos, which is the safest motorway in Greece and one of the safest in the world. Attica Tollway was recently awarded the 1st Prize for Road Safety by the International Road Federation (IRF), in recognition of the quality road safety services provided to the Attiki Odos users. More specifically, according to official figures, the percentage of serious traffic accidents in relation to the vehicle*kilometres driven on the Attiki Odos, is currently 3 to 4 times lower than in similar motorways in the country, while it is on the same scale as European motorways.

Its remarkable performance is mainly due to

a) The high standards used for the construction and the continuous maintenance of the motorway
b) The 24/7 mechanism of traffic monitoring and response to the incidents

The latest main indices on fatal road accidents are presented in the following table:

Fatal Accidents / 10^8 veh*km	0,3
Deaths / 10^8 veh*km	0,4

Table 15: "Attiki Odos" traffic safety: accidents/ M veh*km

- **Technologies in use**

Traffic management and monitoring systems and technological infrastructure already in operation in Attiki Odos, include the following subsystems:

- Closed-Circuit Television (CCTV) cameras for traffic control: operating cameras per 1 km of open highway sections and per 125 m in tunnels. Images from the cameras are transfered through autonomous fiber optic network to the motorway TMC.
- Vehicle Detection Stations (VDS): Each station has one or more pairs of inductive loops for the measurement of traffic volume, speed and roadway occupancy, providing data in real time for each lane separately. Due to high traffic volume, loops are densely spaced per 500 m on incident detection sensors, using special algorithms that give notice to the TMC in case of sudden alteration in the measured data.
- Traffic Monitoring Units (TMU): Each TMU collects VDS data and calculates the number of on-road vehicles, their speed and roadway occupancy, thus figuring the fraction of time during which the motorway is occupied by vehicles.
- Variable message signs (VMS): Are located in all entries and also within the motorway at critical points. VMS are controlled by the TMC and provide information / warnings to drivers on incidents ahead, orders for compulsory diversion or lane change, extreme weather conditions, recommendations on alternative routes, estimated travel times, etc, based on information collected by the TMC from other ITS systems of the motorway. In all VMS, messages are available in Greek and English.
- Electronic signalling: Comprises Variable Speed Limits Signs (VSLS) and Lane Control Signs (LCS), arranged regularly along the freeway and activated mainly in case of incident, in order to warn drivers on potential lane closure/s, as well as on new, decreased speed limits to be adopted by drivers in the incident area.
- Over Height Vehicle Detection (OHVD): located in all entries and alert the TMC when an over height vehicle (designated/ customizable) enters the highway.
- Meteorological Data Sensors: their operation is imposed by the environmental conditions of each project site and comprises measurements of air and road temperature, humidity, atmospheric pressure, wind speed, pollutant emissions, noise levels, etc. In case of breach of the allowable values, the TMC is alerted for implementing appropriate actions, in accordance with the motorway operation manuals.
- Emergency Roadside Telephones (ERT): There is 1 ERT phone per 2 km, along the entire highway. Drivers may use these in order to report problems such as accidents or car damage.
- Emergency Vehicle Location System: In case of an incident, Emergency Vehicles are directed by the TMC, which monitors all GPS equipped vehicles through the Automatic Vehicle Location (AVL) System for the optimum management and minimum response time. Communication between emergency vehicles and TMC is conducted through wireless TETRA system, while the e-Call system is currently being deployed.

- **Real- Time data**

Since 2009, interoperability of the Attiki Odos traffic data collection system with the respective system of the Prefecture of Attica (Athens TMC) is fully deployed and operational. In Real-Time and on a constant basis, Attiki Odos provides its traffic data to the Athens TMC, so that they become integrated with the rest main network data of the Attica Region and available to the users of the road network.

4.4.3.2 Other Major Motorways (TERN):

Other major motorways are:

- Ionia Odos
- PATHE
- Olympia Odos
- Moreas
- Aegean Motorway

All major road projects implement ITS for the motorways traffic management and the provision of information. Other systems comprise toll collection, vehicle detection and safety systems. When fully deployed, each Motorway Management System will comprise the following subsystems:

- Traffic management and monitoring systems and technological infrastructure
- Inductive loops for real-time monitoring of traffic volume, density and average speed
- CCTV and other traffic control cameras and sensors for automated incident detection
- Variable Message Signs (VMS) located at critical points for the provision of Real-Time information to the drivers
- OHVD systems for Over Height Vehicle Detection
- Meteorological and environmental stations
- AVL for fleet management and monitoring
- Real time incident recording system
- Incident management & response systems
- Emergency Roadside Telephones (ERT)
- Electronic Toll Collection
- e-Call

Interoperability
The Greek Interoperable Tolling System (GRITS) is a service provided free of charge by the participating road networks of Attiki Odos, Olympia Odos, Moreas, Aegean Motorway and Rion-Antirion Bridge, which allows the use of the same transponder at all electronic toll lanes of the participating motorways, making the journey to Southern, Central and Northern Greece faster and easier. The service may be extended to other motorways

Road Safety
According to recently recorded data, the Road Safety index is depicted in the table below (data available for Olympia Odos and Moreas)

M/way	Index (per 10^8 veh*km)	2008	2009	2010	2011	2012	2013
Olympia Odos	Fatal Accidents	1,29	1,04	0,65	0,72	0,42	0,45
	Accidents involving Injuries	1,84	2,63	2,30	2,26	1,98	1,86
	Total Accidents	3,13	3,67	2,96	2,97	2,40	2,31
Moreas	Fatal Accidents	0,79	0,79	0,77	0,19	0,82	0,19
	Accidents involving Injuries	3,17	3,94	3,85	3,23	3,30	2,08
	Total Accidents	3,97	4,73	4,62	3,42	4,12	2,27

Table 16: Road Safety Indexes

The overall road safety levels can be attributed to the existence of both systems and infrastructure, as well as to the reduced traffic congestion which is considered to be an effect of the recent economic challenge.

4.4.4 Public Transport: The cases of OASA, OASTH, SASTH & HIT

4.4.4.1 OASA (Athens Urban Transport Organization)

OASA, the Athens Urban Transport Organization, serves a wide area that comprises a total of 84 municipalities and communities. The new ITS projects of OASA which are currently underway, are:

a.	Integrated Telematics System	underway
b.	Automated Fare Collection System	final stage of contracting
c.	Integrated Passenger Information System	planned

Table 17: OASA ITS projects

a) Implementation of Integrated Telematics System for buses and trolleybuses

The project objective is to implement an integrated telematics system for buses and trolleybuses for passenger information and fleet management, through PPP.

The project involves the installation of a network of 1000 ICT stops throughout the area of responsibility of the OASA. Passengers will be informed of the exact transit times, through screens installed at the stations, as well as through their mobile phone and PC.

Control centers are also envisaged for

(i) the real-time monitoring of the transport system operational status and
(ii) the necessary interventions to improve the coordination and optimization of the transport operation.

This is the first step in implementing an integrated plan for the creation of a model urban transport system, which will help improve the everyday life of travelers and the productivity of the transportation operation.

b) Implementation of Automated Fare Collection System for the Athens Urban Transport

The project objective is to gradually replace the traditional paper ticket by electronic 'smart cards', which will greatly facilitate passenger access to public transportation, and will enable OASA to implement flexible and fairer pricing for traveling.

This system will cover and serve all modes of public transport (thermal and electric buses, trolleybuses, metro, tram, suburban railways, operating in the OASA competence area. The system will be implemented and operated through a PPP.

The system will comprise the following features:

- It will support two types of ticket price in the form of electronic "smart cards", in which will be stored any data of the ticket fare and use will be required for the implementation of fare products.
- Validation of "smart cards" will be mandatory in every boarding, even if they stand for prepaid or free of charge cards. In the case of operators where the system will be implemented as a “closed system”, validation will be mandatory at exits as well.
- The equipment will include smart cards issuing, recharging, validation and control terminals, as well as operations centers, with terminal and transaction security mechanisms.

c) Integrated Passenger Information System

The project objective is the implementation of intelligent, automated information systems, which will promote the best use of public transport and draw maximum value from their allotted transport services, providing all the necessary information to all citizens.

The information services will be provided through the website of OASA, which will be radically upgraded, and will be available through all digital platforms: call center, IVR, mobile telephony and Info kiosks. The latter will be placed at key points in the system, including transit points to the rapid and express services, intercity terminals and service facilities in public events that attract large crowds, in order to provide detailed information on trip planning, such as the location of stops and stations, comprising all means and services of large passenger terminals (e.g. ports, airport).

The main pillar of this project is the real-time updating of geographical and temporal data, such as time schedules and operating conditions of all means, based on new technologies. This calls for the speedy updating of all data sources, so that correct information is linked directly into the integrated information system and made available to travelers promptly.

A prerequisite for the proper and efficient operation of the system is to develop a single database comprising raw data, as well as data automatically derived from secondary systems (other applications used for the implementation of transport operation). Likewise, automatic updating will be achieved in real time on the exact transit times of vehicles by telematic monitoring systems. The information system is desired to be adjustable and applied in such a way as to allow for the optimization of services and adaptation of the demand to the transport supply capacity.

The objective will be realized through the development, deployment and operation of a new, modern and of excellent quality trip-planner, ie an information service, which responds mainly to the question "which route will take me from A to B by public transportation?“ .Apart from the "optimal route" the trip-planner will provide comprehensive information on the public transport network, the fare types and the available passenger services.

ITS services are offered to the citizens also by STASY, one of the OASA group company, that incorporates three urban rail companies, namely: AMEL S.A (metro system operation), ISAP S.A (urban rail), and TRAM S.A. (tramway). The main services offered by STASY are:

- Vocal announcement system

This system is used for the provision of emergency information to passengers. It is used by all Control Centers but also locally by the stations administrators. It enables to perform direct (live) or taped announcements across the network, either selectively per line, as well as in selected stations. It also provides the administrator with the ability to either perform local communications across the station, or selectively or at the platforms or at the transit level.

The system consists of:

- Line 1: 24 microphones, 49amplifiers, 12 monitors and 1129 speakers.
- Lines 2 & 3: 60 central audio management units, 4200 speakers, 342 microphones, 148 platform announcements Units, 38 announcement units.
- Tram Line: 2 microphones, 1 central digitization unit, 48 local decoders and amplifiers and 192 loudspeakers (4 per station)

- (Visual) Passenger Information System (PIS)

The visual information systems informs passengers on the arrival/departure time and the direction (terminal) and the next two trains/trams. This information alternates in Greek and Latin characters at a frequency of about 5 s. In some lines, the system can transmit other information of general interest, while brightness is adjusted according to the external conditions.

Data is dynamically calculated by the central control center servers, taking into account the current train positions through the control systems (ATS, GPS) and the time-distance between stations/stops.

This data is transferred through an optical fiber network from the central network management point (Control Center) to local stations/stops.

The system consists of:

  - Line 1: 60 LCD screens (1 or 2 per dock, depending on geometry)
  - Lines 2 & 3: 148 duplex LED screens, located at the platforms of channels (2 units/platform).
  - Tramway: 96 duplex LED screens (1 unit/platform)

- Passenger Information System for Lines 1, 2 & 3

This system displays useful information for the traveling public. The content is controlled centrally by the Operation Control Centers, from where it is transferred to the local stations via fiber optic network.

The system consists of:

  - Line 1: 30 plasma or LCD screens and an equal number of industrial computers installed in 16 main passenger stations.
  - Lines 2 & 3: 133 plasma screens installed on the stations platforms and 27 Infokiosks.

- In-Vehicle Passenger Information System

For the on board passengers' information, visual and audio communications system are installed, which automatically announce the next stop in Greek and English.

In line 1, duplex LED screens are installed on all trains, in the center of each wagon.

In Lines 2 & 3, 2 led screens are located on both ends of each wagon. Additionally, on new generation trains, a duplex color screen is located in the center, displaying further information.

On the tram line, there are seven pairs of color LCD monitors displaying the the 3-4 next stops of the route, general information and advertising messages in video format, without sound.

- "Green Wave" for the Tramway

The prioritization of the tram at the traffic lights ("green wave") was one of the mainstays in the Athens tram design. It is the integration of the effects of tramway traffic on traffic signaling, based on the traffic characteristics at the road/tram crossings (intersections). Thanks to this system, the total route time of tram has dropped significantly, in favor of the passengers.

In total, there are about 100 crossings, at which the tram either moves:

  - with absolute priority
  - by demand
  - parallel to the road green wave.

The priority system on each node is the result of traffic studies, which have taken into account the tram priority over other road vehicles, always in correlation with the current traffic conditions. These studies are revised and reapplied whenever there is a considerable shift in traffic conditions. The tram vehicles are equipped with Automatic Vehicle Location system (AVL) which according to the line data sends wirelessly the request for priority to the local traffic controller for the activation of the corresponding traffic light. In critical tramway junctions, an Uninterruptible Power Supply (UPS) system has been installed to ensure the normal operation of road and railway signaling in the event of a power outage.

4.4.4.2 OASTH-SASTH:

OASTH – The Urban Transport Organization and SASTH – the Urban Transport Council of the city of Thessaloniki, which is one of the smarter cities at European level, are implementing innovative ITS for public transport. The main applications are:

- OASTH telematics
- Interactive passenger information services
- ICT bus stops
- Passenger information via mobile web technologies
- SPEED-O Conurbation Traffic model
- NODES: Procurement of passenger information equipment (infokiosks & VMS) in a bus terminal
- Integrated and intelligent payment and fare collection system (e-wallet) for Urban Transport in Thessaloniki

- Real Time Applications
    - **Fleet Management**
        - Vehicle Location and Monitoring
        - Bus Route Management
    - **Passenger Information**
        - Web
        - Mobile Web (smart phones)
        - In-bus Information
        - "Intelligent" Bus Stop
        - Conventional Telephone

- Real Time Passenger Information
    - **Information BEFORE the Trip** [+Optimal Route (Journey Planner / How to Go Where)]
        - Web,
        - Mobile Web,
        - Conventional Telephone

OASTH passengers may be informed about telematic services by telephone (mobile or fixed), through an interactive response system.

Line arrivals	1	After entering the number of the bus line and the bus stop code, the system will give you an estimated time of arrival at the specific stop for the first three (3) busses of the line you selected.
More than one line arrivals	2	After entering the bus stop code, the system will give you the specific stop and the arrival times of the first bus of every line passing by that stop.
Stops made by a specific line	3	The system will give you the names of all the stops a specific bus line makes in both directions.
Bus lines that stop at a specific stop	4	The system gives you all the bus lines that stop at a specific stop

- **Information DURING the Trip**

    - Mobile Web
    - Bus Arrival Announcement in 200 "Intelligent" Bus Stops (Visual, VMS Displays)
    - Bus Arrival Announcement in 20 Bus Stops (Audio)
    - Audiovisual Announcement in Every Bus

- Future Telematics Applications

    - Passenger Counting / Electronic Payment
    - Intermodal Real Time Passenger Information
    - Bus Priority at Traffic Lights
    - Free Wi-Fi Internet in the Bus
    - Bus Arrival Audio Announcement

- General Traffic Conditions Estimation (based on static/dynamic data)

4.4.4.3 CERTH-HIT

The Hellenic Institute of Transport is part of the Centre for Research and Technology Hellas (C.E.R.T.H.) which is a legal, non-profit entity organized under private law, under the auspices of the General Secretariat for Research and Technology (GSRT), of the Greek Ministry of Education. CERTH-HIT is a major research institute for transport in Greece, producing innovation in transport projects.

- **The HIT Portal**

The Online Services Portal (H.I.T. Portal) of the Hellenic Institute of Transport is fully dep[loyed and operational and it constitutes a pioneer-integrated data management and service provision system that concerns transportations and aims at:

a. the creation of a critical content regarding basic transport fields operation, due to:

- the Institute’s activity in projects, studies and primary research
- institutions maintaining data for own use
- public data from other sites (electronic or through exhibitions)
- processing primary data deriving from one or more of the above three information sources for the generation of secondary data

b. the availability of specialized tools to be used by institutions and

- Observatory
- Freight Routing
- Transport Tools
- Infomobility
- Test Bed
- e-Learning

The observatory aims to provide transport data to the benefit of the users of H.I.T. Portal. This data constitutes precious help to the users of the scientific community, the students but also the citizens that seek information in the sector of transport. The observatory provides the following operations:

- Articles - Studies - Reports
- Map Briefcase
- Indices and Statistics

4.5 Intermodal Services: The case of TRAINOSE

TRAINOSE S.A ITS Services comprise -among others -the following innovative applications of integrated door-to-door intermodal transport services:

- **Intermodal Freight Service**: Intermodal Cargo Shuttle-ICS
- **Intermodal passenger service**: TRAINOTAXI

4.5.1 Intermodal Freight Services

TRAINOSE, following the actions to increase the share of inland freight transport by creating synergies between railway and trucks, provides since December 2013 a new intermodal freight transport service titled Intermodal Cargo Shuttle (ICS) which combines the benefits of the railway which is attractive for large distances in terms of mass transportation, economy, ecology and the flexibility of the truck for the “first/ last mile” of the entire service.

ICS covers a large gap in the Greek market: the regular, daily railway connection of the two main freight Greek centres, Athens and Thessaloniki, as well as the regular, daily railway connection of the two main ports, Piraeus and Thessaloniki. The ICS daily services (Monday to Friday) between Athens Terminal (Thriassion) and Thessaloniki Terminal (Trigono) and vice versa are offered in hours that serve the market needs (departure 20:00, arrival at 06:00). The terminals have suitable transhipment equipment in order to serve 20, 40 & 45 containers (ISO & high cube), while there is the capability of receipt/ delivery of containers to and from the ports of Piraeus and Thessaloniki and from the Customer's facilities through branch lines.

Apart from the pure railway terminal-to-terminal service, ICS provides also door-to-door (alternatively door-to-terminal or terminal-to-door) transport services by the cooperation of trucks in an intermodal seamless way for the customer. The pricing policy included four customer categories (Big Regular, Regular, Spot Market Advance Notice, Spot Market Last Minute) and rewards large and regular users of the service without excluding customers who do not have large volumes of traffic and transport regularity.

ICS is supported by an electronic platform where the customer registers, checks the availability based on his needs, selects the itinerary of interest as well as the part of the transport he needs (door-to-door, terminal-to-terminal, door-to-terminal, terminal-to-door), places the order having direct knowledge of the transport fares, and monitors the orders history. The track & trace feature based on GPS technology will be also integrated in the platform within 2014, providing the capability of real-time container monitoring as well as high security for the shipments

4.5.2 Intermodal Passenger Services

An intermodal, one-stop-shop, integrated-fare transport service is already offered by TRAINOSE. It is based on the combination of train and taxi services exploiting the benefits of mass, safe, economic and ecological characteristics of the railway as well as the flexibility of the taxi for the last mile of the entire trip. This service is attractive in areas where the main transportation means from the railway station to distinct city areas (or bus stations) is the taxi. And it is based on the idea of grouping users’ trip in such a way that the cost of the system is reduced without deviating too much from the shortest path of each user.

TRAINOTAXI service is offered by TRAINOSE in the city of Thessaloniki since 2011. Railway passengers, who select Thessaloniki as their final destination, may also book a taxi in one unique ticket either through TRAINOSE website/ call centre or in the counters of the railway stations, which will drive them from Thessaloniki railway station to their final destination in a seamless dual-hop mode. Thessaloniki is divided to 17 urban zones and for each zone there is a fixed price for the taxi services, no matter of traffic jams etc. The passenger pays once for all parts of the combined trip making the whole service the first successful attempt in Greek territory of integrated fare multimodal trip. Taxi cars that participate in TRAINOTAXI service, park in a dedicated parking area within

Thessaloniki railway station, distinct from regular taxis parking area, thus making the service comfortable for the passengers.

Within 2014, TRAINOSE is planning to expand TRAINOTAXI service to five additional Greek peripheral cities (namely Larisa, Volos, Xanthi, Katerini, and Edessa) whereas the option of booking the door-to-railway station by taxi feature will be also included for all the involved cities. Thus, a fully door-to-door intermodal passenger service will be offered in six Greek cities by TRAINOSE, and the passenger will have the ability to make one-stop-shop bookings either for the entire door-to-door-service or for parts of that (door-to-railway, railway-to-door).

5 Conclusions and next steps

5.1 Assessment of the work on ITS

This report has provided a short summary of the work on ITS in the years from 2010 up to 2014. In just over a short period from the EU's Action Plan and ITS Directive, we have initiated work- together arrangements among our authorities and institutions. With this report, the basis for monitoring and reporting on our progress is developed, and work is initiated to monitor the progress and efficiency of our ITS projects.

5.1.1 Obstacles and challenges

Greece has already implemented a number of large scale ITS projects, mainly in the field of road transport and in the large cities of Greece (Athens and Thessaloniki) or on major motorways, while a lack of ITS deployment in other urban and rural areas is observed. As a result, the deployment of ITS is largely fragmented and limited in geographical scope.

Research, design and implementation have been carried out for years in the ITS area, but without following a common strategic framework for their deployment, a national open architecture and common national or European standards and without always ensuring the required interoperability between systems and services.

ITS applications remained at a pilot stage or within limited scope, without the potential for further growth and expansion. In many cases, administrative, organizational and financial problems prevented the adoption of successful "case studies" on a broader scale.

Moreover, restrictions in financing, high investment costs and inherent weaknesses in the public administration have often hindered the deployment, maintenance and integration of ITS applications.

Due to Greece's particular characteristics, transport networks are faced with substantial challenges in infrastructure connections. Road safety issues are also a significant challenge, especially for road transport operators.

5.1.2 Strengths and opportunities

Due to its geographical position as a European border country and an international transit centre, Greece has the potential to develop ITS services in order to provide smooth and seamless connections for the transport of people and goods. Greece also has the opportunity to develop ITS standards for Cross-Border connections, as well as for connections between the mainland and the islands.

Greece is generally on track to meeting the EU objectives on ITS, but there is still a lot to be done. At the legislative level, Greece has adopted and transposed into the national law the ITS Directive and follows on the adoption of the Delegated Regulations and the fulfilment of the related requirements.

Although Greece has no large-scale industry, its main strengths, regarding the ITS deployment, rest upon its scientific human potential, its scientific experience and know-how, coming from ITS related European projects, research carried out by the country's research institutes and universities, but also from its active participation in ITS organizations and conferences all over the world. These scientific resources, supported by the state and the institutions, have the potential to develop innovation and produce added-value to the economy.

In terms of volume of funding and despite the econopic challenge, as can be seen from the information provided in this report, considerable amounts have been invested collectively during the past years in ITS financing. One good reason to expect more in this respect is that the construction of four large-scale national motorways has been restarted, after a period of standstill. These motorways, will be completed with concession and PPP funding schemes and they will be further equipped with ITS.

Beyond financing, Greece's national research institutions and bodies are working to leverage change in support of sustainable transport through capacity building, knowledge sharing, and policy dialogue, in the field of ITS.

With this report, the development of an initial framework for monitoring and reporting is now completed and it is going to become the basis for further reporting. A set of shortcomings in the collection of data, monitoring and reporting and the need for a permanent monitoring mechanism have been identified and further steps will be taken towards tackling these issues. The added value that derives from this report is that, in the future, researchers, entities and policymakers will be in a position to use and act upon the data that we aimed to generate, but this time on a regular basis.

5.2 Next steps

Recently, Greece has set up the process for the establishment of the National ITS Strategy and National ITS Architecture, by working groups of experts, with the coordination of the Ministry of Infrastructure, Transport & Networks. This crucial "infrastructure", which is currently under preparation, is expected to leverage the deployment of ITS in Greece, as it aims to:

- Create a common framework for ITS planning & design
- Provide guidance for the development of ITS solutions
- Designate a national interoperable ITS structure
- Ensure compatibility of the existing systems with the new, emerging ones
- Yield applications that ensure interoperability & seamlessness
- Establish open interfaces to support the exchange of information

ITS Strategy & Architecture are expected to achieve an integrated national approach on ITS and provide solutions that reflect real user needs.

To further assess the ITS performance and extract valuable conclusions, the operation of permanent monitoring mechanisms, such as an ITS observatory, must be established. The output of the commissions work on KPIs must also be taken into consideration, in order to achieve more effective progress reporting, on a regular basis.

In the future, we expect that it will be possible to use:

Ratings	Qualitative ratings will be assessed for each criterion assessed and for projects as a whole. Aggregation of ratings between projects for reporting purposes will consist in determining the ratio of successful projects that meet a given rating level or target
Indicators	Quantitative indicators will support and complement the assessment of the performance of ITS projects and will help aggregate results. The EIC is also preparing Key Performance Indicators, but the harmonization work that is required must also be acknowledged. When these frameworks will be defined, our existing indicators will be adapted, to assess ITS performance uniformly

Further than building on these initial achievements, we will continue with our efforts to fully implement the ITS Strategy objectives, as defined in the EU policy documents, our National Action Plan and the forthcoming National ITS Strategy for Greece.

6 Annexes

Annex 1: List of projects

I. MOTORWAYS									
Project	**Authority/ Entity**	**Priority**	**Status**	**Budget (*1000 €)**					**Total (*1000 €)**
				2010	**2011**	**2012**	**2013**	**2014+**	
Egnatia Motorway observatory	EGNATIA ODOS SA	**I**	Ongoing				60	150	**210**
Environmental highway observatory/ E-Highway	EGNATIA ODOS SA	**I**	Operational			1,5	90		**91,5**
Geoportal	EGNATIA ODOS SA	**I**	Ongoing					193	**193**
SCADA/TMS application development and other E/M activities	EGNATIA ODOS SA	**I II III**	Ongoing	274	2259	1577	276		**4386**
Upgrading of the SCADA/TMS host applications	EGNATIA ODOS SA	**I II III**	Ongoing					395	**395**
PATHE Motorway Management System for traffic & incident management	Nea Odos	**II III**	Ongoing	3205	997	1626	602		**6430**
IONIA ODOS Motorway Management System for traffic & incident management	Nea Odos	**II III**	Operational	1874					**1874**
Field Operational Test	Nea Odos-EC	**II III**	Ongoing		7	20	57		**84**
Motorway Back office system	Nea Odos	**II IV**	96% completed	1959			2822		**4781**
Procurement and installation of VMS	Nea Odos	**III**	50% completed				425		**425**

Installation of meteorological stations & air quality measurement stations	Nea Odos	**I**	Operational	43		129	43		**215**
Installation of vehicle detection system	Nea Odos	**I**	95% completed			150	150		**300**
Traffic Management Center	Nea Odos	**II** **III**	Operational	90	50				**140**
CCTV Cameras	Nea Odos	**III**	Operational			350	150		**500**
Harmonized e-Call EU Pilot	Nea Odos	**III**	Operational			14	40		**54**
Additional Motorway Back Office system	Nea Odos	**II** **IV**	Ongoing			3500	1500		**5000**
Aegean Motorway Management System for traffic & incident managemen (Malliakos-Kleidi)	Aegean Motorway SA	**I** **III**	48% completed	1268	571	252	535		**2626**
Olympia Odos Motorway Management System (Elefsina-Korinthos-Patra-Pyrgos-Tsakona)	Olympia Odos	**I** **III**	Ongoing	298	69		1034		**1401**
Integrated System for monitoring & management of traffic, incidents & equipment of Moreas Motorway (Korintos-Tripoli-Kalamata)	Moreas	**I** **III**	Operational	7543	580	1160	2321		**11604**
Attiki Odos TMC infrastructure upgrading	Attiki Odos	**I** **III**	Operational	2000	2000	100	100		**4200**

Greek Interoperable Tolling Systems - GRITS	Motorway concession partner companies: Attiki Odos, Aegean Motorway, Olympia Odos, Moreas, Rion-Antirion bridge	**I II**	Operational		50	50	30		**130**
				19822	7154	9181,5	10253	1255	**47665,5**

II. URBAN NETWORK

Project	Authority/ Entity	Priority	Status	Budget (*1000 €) 2010	2011	2012	2013	2014+	Total (*1000 €)
Operation and maintenance of the Athens Traffic Management Center	Prefecture of Attica	**I III**	Ongoing	2000	2000	2000	2000		**8000**
GIS procurement	Thessalo-niki Urban Transport Organiz. OASTH	**IV**	Operational	9,3					**9,3**
Extension of the Telematics System for tracking & traffic management in 19 new buses	OASTH	**IV**	Operational		19,4				**19,4**
Extension of the Telematics System for tracking & traffic management in all 536 buses	OASTH	**IV**	Operational	3,4	1,6	1,4			**6,4**
Procurement, installation & commissioning of bus automation system	OASTH	**IV**	Operational	4,3	11,6	4,5			**20,4**

Procurement, installation and commissioning of additional equipment for the bus automation system	OASTH	**IV**	Operational			1,1			**1,1**
Interactive passenger information services	OASTH	**IV**	Operational	51,8	6,5				**58,3**
Procurement & Installation of a new call center, upgrading and consolidation of voice & data networks	OASTH	**IV**	Operational	93	6				**99**
Procurement of 200 ICT bus stops	OASTH	**IV**	Operational	6,8					**6,8**
Procurement of 870 ticketing machines	OASTH	**IV**	Operational	397	759	707	120		**1983**
Passenger information via mobile web technologies	OASTH	**IV**	Operational				35		**35**
New telematics application in 10 OASTH buses	OASTH	**IV**	Operational			33,2			**33,2**
Procur. & installation of voice announcement system for transit buses - 19 bus stops	OASTH	**IV**	Operational		15,3				**15,3**
OASTH HR development services	OASTH	**IV**	Ongoing				36		**36**
SPEED-O Conurbation Traffic model	OASTH	**IV**	Operational		5	5,5			**10,5**
NODES: Procurement of passenger information equipment (infokiosks & VMS) in a bus terminal	Thessaloniki Urban Transport Council - SASTH	**I**	Contractor to be installed					32,3	**32,3**

Integrated & intelligent payment & fare collection system (e-wallet) for Urban Transport in Thessaloniki	SASTH	**I**	Pilot test completed						22300	**22300**
Integrated automated fare collection system for the OASA companies	Athens Public Transport Organization - OASA	**I**	Ongoing						34758	**34758**
Digital remote fleet management & passenger information services	OASA	**IV**	Ongoing						9973	**9973**
Digital traffic information services for metropolitan municipalities of Crete	Municipality of Chania	**III**	Ongoing					398		**398**
Integrated ITS and telematics system for passenger information	Prefecture of Cyclades/ Municipalities of Naxos, Donoussa Thera, etc	**II**	Ongoing					168		**168**
Integrated ITS and telematics system for passenger information in Municipality of Xanthi	Prefecture of Xanthi	**II**	Ongoing					190		**190**
Intelligent multi-channel passenger information system for public transport in Kos island	Prefecture of Dodecanese/ Municipality of Kos	**II**	Ongoing					139		**139**
Intelligent multi-channel passenger information system for public transport in Rhodos island	Municipality of Rhodes	**II**	Ongoing					191		**191**

Integrated multi-channel sytem for managing and monitoring road traffic conditions	Municipa-lities of Lamia, Domokos, Makrako-mi, Stylida	**II**	Ongoing				256		**256**
Park-n-Ride: integrated system for a) driver information on available parking places b) multi-channel passenger information	Municipa-lity of Korinthos	**III**	Ongoing				282		**282**
Intelligent parking & transport services	Municipa-lity of Kropia	**III**	Ongoing				268		**268**
Innovative driver information system on incidents and available parking places in the Municipality of Nestos	Prefecture of Kavala	**III**	Ongoing				101		**101**
Integrated driver information system on available parking places in the Municipality of Kalamaria	Municipa-lity of Kalamaria	**III**	Ongoing				262		**262**
Electronic control System for availability of parking places & automated driver information in Municipality of Megara	Prefecture of Attika	**III**	Ongoing				195		**195**
Intelligent information system on traf-fic conditions public transp. arrivals & available parking places (multi-channel communication)	Municipa-lity of Kordelio - Evosmos	**II**	Ongoing				255		**255**

Intelligent telematic system for driver & passenger multi-channel information on transport and parking	Municipa-lity of Kalamata	**II**	Ongoing				196		**196**
Integrated platform for traffic management and monitoring for passenger information on traffic conditions, (multi-channel communic.)	Municipa-lity of Kavala	**II**	Ongoing				212		**212**
Integrated ITS information system on & public parking places management system	Municipa-lity of Pefki	**III**	Ongoing				227		**227**
Integrated passenger information system on public transport schedules and driver information system on available parking places	Municipa-lity of Vyronas	**II**	Ongoing				278		**278**
Intelligent urban mobility management and traffic control system for quality improvement of the urban environment within the conurbation of Thessaloniki	Prefecture of Central Macedo-nia	**I** **II**	Operati onal			2767			**2767**
Road users information system- Thessaloniki's eastern ring road	Prefecture of Central Macedo-nia	**I** **II** **III**	Operati onal	1400					**1400**

MOBINET: Urban mobility Centre for the Municipality of Kalamaria & electronic services deployment for the information of commuters via the web	CERTH/ HIT	**I II**	Operational		15				**15**
VIAJEO: transportation planning & commuters information platform	CERTH/ HIT	**I II III**	Operational			560			**560**
SEE-ITS: Its in South-East Europe	CERTH/ HIT	**I II III IV**	Ongoing					525	**525**
COMPASS4D	CERTH/ HIT	**I II III IV**	Ongoing					671	**671**
ICT services for managing urban touristic coaches and servicing passengers	Ioannina urban touristic coaches	**II**	Ongoing					962	**962**
	Xanthi urban touristic coaches	**II**	Ongoing					634	**634**
	Trikala urban touristic coaches	**II**	Ongoing					678	**678**
	Patra urban touristic coaches	**II**	Ongoing					1640	**1640**
	Mytilini urban touristic coaches	**II**	Ongoing					651	**651**
	Chios urban touristic coaches	**II**	Ongoing					667	**667**
				3965,6	2839,4	6079,7	5809	73491,3	**92185**

III. URBAN & INTERURBAN

Project	Authority/ Entity	Priority	Status	Budget (*1000 €) 2010	2011	2012	2013	2014+	Total (*1000 €)
COGISTICS: Cooperative Logistics for sustainable mobility of goods	CERTH/ HIT	I II IV	Ongoing					724	**724**
Study on the need to improve school transport system to the purpose of effective implementation of the 21st century school	Ministry of Education	I	Operational		79				**79**
i-student trip: integrated system for the safe transport of students	CERTH/ HIT	I	Ongoing					561	**561**
					79			**1285**	**1364**

IV. NATIONAL ROAD NETWORK

Project	Authority/ Entity	Priority	Status	Budget (*1000 €) 2010	2011	2012	2013	2014+	Total (*1000 €)
Deployment & operation of the E-Drive Academy	Information Society - InfoSoc	II	Ongoing				597		**597**
ACTIS- advanced freight transport services	CERTH/ HIT	II	Ongoing					500	**500**
							597	500	**1097**

V. NATIONAL & EU ROAD NETWORK

Project	Authority/ Entity	Priority	Status	Budget (*1000 €)					Total (*1000 €)
				2010	2011	2012	2013	2014+	
Harmonized e Call European Pilot – phase 2	Ministry of Infrastru-cture Transport & Networks	III	Ongoing	100	255	150	150		**655**
Electronically readable signal for special tourist buses	Ministry of Infrastru-cture Transport & Networks	I II	Ongoing			116			**116**
				100	255	266	150		**771**

VI. CROSS-BORDER NETWORK

Project	Authority/ Entity	Priority	Status	Budget (*1000 €)					Total (*1000 €)
				2010	2011	2012	2013	2014+	
EASYTRIP: GREECE – BULGARIA e-mobility solutions	CERTH/ HIT	I II III	Operational				1079		**1079**
System development for automated Cross-Border freight train traffic recording (incoming & outgoing)	TRAINOSE	II	Ongoing - pilot testing for Idomeni & Gevgeli Railway Stations					IR	
							1079		**1079**

VII. MULTIMODAL-RAILWAY

Project	Authority/ Entity	Priority	Status	Budget (*1000 €)					Total (*1000 €)
				2010	2011	2012	2013	2014+	
ICS - Intermodal Cargo Shuttle RAIL+TRUCK	TRAINOSE	II	Operational				IR: Internal Resources		
TRAINOTAXI intermodal passenger service	TRAINOSE	I	Operational - expanding in more cities					IR	

Digital mapping of the railway network and registration of timeschedules in the Google Maps Tansit service	TRAINOSE	I	Operational				IR		
System development for the provision of information on the Athens Suburban Railway time scedules in RealTime	TRAINOSE	I	Schedu-led					IR	
Integrated passenger service & freight orders handling system development - interconnection with the ICS	TRAINOSE	II	Schedu-led					IR	
Safe Freight transport: Use of GPS technology on containers for continuous tracking and breach notification	TRAINOSE	II	Ongoing					IR	
Public Information System	TRAINOSE	I	Operational - optimization & expansion in more cities				IR		
IP Surveillance System	TRAINOSE	I	Ongoing - already implemented for fuel supply control in railway engine rooms					IR	
Network Operating Center	TRAINOSE	II	Ongoing					IR	
Freight transport registering system development	TRAINOSE		Operational in Ikonio-Thriasio & Trigono-OLTH, expansion in other Freight Stations					IR	
Freight control application development	TRAINOSE	II	Operational					IR	
Freight pricing system development	TRAINOSE		Operational		IR				
Further freight control via QR codes system	TRAINOSE		Schedu-led					IR	

Train tracking system development via GPS	TRAINOSE	**II**	Ongoing					IR	
Installation of RFID system on trains	TRAINOSE		Ongoing					IR	
Launching of tickets.trainose.gr website	TRAINOSE		Operational	IR					
Electronic ticketing services	TRAINOSE		Operational	IR					
Passenger services mobile application	TRAINOSE		Operational/ upgra-ding					IR	
TMC application development	TRAINOSE	**II**	Operational		IR				
Mobile app for ticket issuing & control within the train	TRAINOSE		Ongoing					IR	
Integarted ticketing system development	TRAINOSE	**I**	Ongoing				IR		

VIII. SEVERAL

Project	Authority/ Entity	Priority	Status	Budget (*1000 €)					Total (*1000 €)
				2010	2011	2012	2013	2014+	
e-Freight	CERTH/ HIT	**II**	Operational					926	**926**
TeleFOT project (Field Operating Tests)	CERTH/ HIT	**I, III, IV**	Operational	455					**455**
FOTsis	CERTH/ HIT	**I, III, IV**	Operational	273					**273**
ERMIS-Fleet Management System	CERTH/ HIT	**I, II III, IV**	Operational	300					**300**
SAFERIDER - Motorcycle Driver Assistance Systems	CERTH/ HIT	**III**	Operational	195					**195**
GIS for road accidents in Prefecture of North Aegean	Islands of Lesvos, Chios, Samos, Ikaria	**I**	Operational	30			10		**40**
				544,92	319,92	319,92	78,25	926	**2189**

Asssumptions used in Annex I:

The following assumptions were used in determining that ITS investment data are fit for the purposes of this report. These assumptions include assumptions for investment periods, scope and correlation of projects and other factors as appropriate. Results are considered over the suitable time frame and scope, as requested by the Commission, to ensure consistency with the missions and goals of the ITS Progress Report. All data was collected based on the following assumptions:

- Principally ITS projects funded during the period 2010-2013 were considered in this report
- In several cases, investment data was provided for 2014 project funding or even 2015 (in exceptional cases). In these cases, this information was segregated and presented in a separate column (2014+).
- Data refferred to in column “2014+” is not comprehensive, due to the fact that the year 2014 is not over yet and thus reporting has mainly focused on the period 2010-2013.
- Only ITS projects within the scope of the ITS Directive were recorded.
- In cases of EU funded projects, only the component of funding that corresponds to the Greek side has been included.
- The questionnaire for the collection of data has been addressed to a wide range of authorities and entities implementing (or that could possibly be implementing) ITS projects. Even though the major part of them were able to respond to the survey by providing their information, there is a still a share of bodies that didn’t provide their feedback. As a result, there is a certain rate of underreporting that must be taken into consideration when extracting results.
- Due to an extensive share of privately funded ITS applications, it has not been possible to identify the full range of them and therefore, the provided list of ITS projects is not exhaustive.
- Source of funding is not surveyed, as it has not been a criterion for consideration at this stage.
- Results are based on the data provided by the respective authorities/entities. Cross checking has applied in cases that information on the same project derived from different sources.
- In order to avoid duplications in reporting, common ITS projects were either registered by the main implementing authority or by including all participating bodies.